Railway Age Gazette

Including the Railroad Gazette and The Railway Age

PUBLISHED EVERY FRIDAY, AND DAILY EIGHT TIMES IN JUNE, BY
THE RAILROAD GAZETTE (INC.), 83 FULTON ST., NEW YORK.

CHICAGO: Plymouth Bldg. CLEVELAND: Williamson Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico..... $5.00 a year.
Canada..... $6.00 a year.
Foreign Edition (London).....£1 12*s.* ($8.00) a year.
Single Copies.....15 cents each.

Shop Edition and the eight M. M. and M. C. B. Convention Daily issues, United States and Mexico, $1.50; Canada, $2.00; Foreign, $3.00.
Entered at the Post Office at New York, N. Y., as mail matter of the second class.

VOLUME 49. FRIDAY, NOVEMBER 4, 1010. NUMBER 19.

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WE publish this week in the General News Section an index to the monthly earnings of all the roads reporting to the Interstate Commerce Commission whose figures are included in our weekly table of Revenues and Expenses of Railways. In connection with this index there are published the figures for various roads whose returns to the Interstate Commerce Commission came in too late to be included in the current months in which they belonged. The Interstate Commerce Commission requires all railways to report their revenues and expenses within a specified time after the close of each month. Some companies, however, find it impossible to get in their returns for certain months within the time allowed them, and in cases where a company does not make returns until after we have begun to publish the figures for the succeeding months for other roads there has been no practical way of showing these figures at all. This supplementary table now fills in these gaps wherever the roads have made reports. With the publication of this index it becomes possible to trace the earnings and expenses of each month through the entire fiscal year. Some railways give figures for monthly earnings and expenses in their annual reports, but very few of them give as full details as are reported to the Interstate Commerce Commission. As far as we know, such a complete record of roads for each month has not before been published in any form.

THE Interstate Commerce Commission is under no great obligation to the western shippers for assistance rendered by them in getting before it facts on which it can base a decision as to whether advances in freight rates are justifiable. The testimony introduced by them at Chicago took little of the commission's time and was almost entirely worthless. The only witness they called who was able to withstand the fire of the railway lawyers on cross-examination was Governor W. R. Stubbs, of Kansas, and he succeeded in preventing his testimony from being shot to pieces only because he absolutely refused to answer the railway lawyers' questions. He put in evidence some estimates as to for what he thinks he could rebuild the railways in Kansas. His estimate of the cost of reproducing the branch lines in Kansas was $15,000 a mile, and of the main lines $25,000 a mile. It was promptly shown that his figures included no allowances for cars and locomotives, right-of-way or terminals, and that the railways within very recent years have actually paid a great deal more for construction work under conditions similar to those existing in Kansas than his estimates. The attorneys for the railways made two of the important witnesses for the shippers admit that they had themselves a short time ago advocated advances in freight rates. One of the witnesses sought to show that the valuation placed by General Manager Ward of the Burlington on the terminals of his road in Omaha was excessive, but on cross-examination the fact was brought out that in making his estimate he had overlooked some 113 acres of terminals. Several of the witnesses for the shippers testified that the railways formerly gave large rebates, and expressed the opinion that now that they did not give the rebates they should be able to live on the present rates. When counsel for the railways tried to get them to tell who had received the rebates and how much they amounted to, they were able to get only one specific instance where rebates had been given. The shippers thundered in the index a great deal before the hearing began about how they were going to prove that the railways were over-capitalized and were making excessive profits, but utterly failed to make any headway in establishing these things.

ONE of the pet statements repeated frequently by Governor Stubbs in his testimony was that the railways should be subjected to the same kind of regulation as national banks. As the governor was the star witness for the shippers, it is interesting to compare the financial results of the railways and the national banks. The net earnings of the railways in 1909 on their average capitalization per mile of $59,259 were 5.7 per cent. The net earnings of the national banks in the same year on their capitalization averaged 14.3 per cent. Shippers often complain about the large surpluses that some railways have accumulated. The total capitalization of 6,788 national banks in 1909 was $919,143,825, and their aggregate surplus was $585,407,483, or 62 per cent. of their capitalization. The net earnings of the national banks in 1909 were 8.72 per cent. of their combined capitalization and surplus, and no longer ago than 1907 their net earnings on their combined capitalization and surplus combined were 11.21 per cent. Their dividends in 1909 amounted to 10.12 per cent. of their capital and to 6.18 per cent. of the capital and

surplus combined. We fancy that if the shippers want, as Governor Stubbs says they do, the same rule applied to railways and national banks, they will have no great difficulty in persuading the railways to come around to their view. Of course, what the critics of the railways will answer is that the railways are over-capitalized. But even if it should be conceded, for the sake of argument, that half of the railways' capitalization is water, still, on that basis, their net earnings in 1909 would have been but 11.4 per cent., or 3 per cent. less than those of the national banks. If the shippers make no better showing with the testimony they introduce in the eastern rate cases than they have in the western cases, the commission, if it shall find the proposed advances unreasonable, will have to base its findings on other grounds than any that the shippers have furnished.

THE "NEW NATIONALISM" AND THE RAILWAYS.

THE term "new nationalism," as invented and constantly repeated by its vociferous expounder, looks like a phrase that, at least for a time, will hold its prominence. It has that catching and alliterative quality that makes it easy on the tongue, and it has somewhat more definiteness than the adjective "progressive" shifted into a noun of multitude to describe a large section of a great and historic political party. It has, to be sure, its lighter or darker shade of meaning more or less based on geographical lines. It is more intense and far-reaching in the relatively radical West than in the conservative East. It means more, or is intended to mean more, in that fertile sprouting ground of "isms"—Kansas—than in New York state or New England, which are less adapted by tradition, habitude, temperament and material interests to the same crop. But the underlying idea runs through it in all states—extension of federal authority, with consequential restriction of state authority and jurisdiction. It has many forms of theory and of application, noteworthy among which, and, in fact, a focal point of some concentration, is the railway. In a sense there is a certain degree of logic in such concentration. For, with the merger of small lines into great systems, those systems have become more and more interstate instead of intrastate institutions, and thus come under the technical as well as actual purview of federal influence.

But a counter fact has not received its full share of attention. While the scope of interstate and federal authority and functions has been growing, an intrastate authority has also been expanding. Two years have hardly passed since there was what would be called commercially a "boom" in state railway and public utility commissions. It still continues, though with somewhat diminished activity; and it has been an extension not merely of powers, but of the material on which the powers have been exercised. The old function of the state commissions related to steam railways alone. It reached next to the street railway, then to a long series of public service corporations and interests, and now is including rapidly the telegraph, telephone, express, power, water and kindred corporations—almost everything that can be interpreted as having a public relation. Side by side these two large processes of blended economic and civic evolution are going on. "New stateism," if that noun may be coined offhand, is in a kind of race with the new nationalism, both of them with the railway as one objective. They are drawing nearer and nearer to a sharp meeting point; indeed have met already at such a point, for example, as demurrage. When they meet along a wider front and with, perhaps, greater pace and impetus than now, will they harmonize, will they clash, or will there be a retreat on one side or the other?

The railway corporations, now under the hammer of both state and federal legislation, have a vital interest in the answer to this query. It involves something like a return to the old order or a progression to a new one, the ultimate of which may even be federal ownership and operation. On the one side, there is the force of state rights imbedded in strong tradition, bulwarked behind the federal constitution as strictly construed, intrenched behind many a judical decision and, what is perhaps of more ultimate importance, set firm in the convictions of the conservative citizen who owns property, especially railway property—less firmly but still decidedly potential in the purely commercial group. On the other side is the claim of the impotency of the states to deal with interests alleged to have far outgrown them; the difficulty of securing concordant state action; the difference between the simplicities of a nation of a few millions of people and the complexities of a nation nearing a hundred millions; and finally, but not last in its meanings, the transfer of voting strength from a conservative class to an electorate much less so, in which old principles and traditions count for little, and immediate interests—often narrow and selfish—for much. State versus Nation is possibly too strong a phrase to describe such lines of division in a friction probably not far away. But at present the situation has that look, with the railway as one of the issues.

But, very fortunately for the railway, it finds in the new nationalism elements that ameliorate its perils. The railway, its regulation, revaluation, rates and the broader question of the extent of federal power may supply one issue, but they do not supply the only one. When the great and erstwhile victorious Whig party broke up, between 1848 and 1856, it could recrystallize in the latter year and win victory four years later on one great moral issue—slavery. The new nationalism and its opposition, already taking coherency and form, have, by contrast, many issues—including pre-eminently the tariff—that divide and divert the political giants and relax their impact on the railway. The issues, moreover, are most of them economic rather than moral or sentimental, and for that reason less provocative of electoral passion and unreason. The country, as a whole or even in any considerable part of it, cannot, if the railways practice due moderation, be brought up to any pitch of frenzy over an economic "issue" of freights and fares. And, even in the unlikely event of the new nationalism becoming dominant, is it not more likely to apply such lauded legislation as the Sherman Anti-Trust act to the trusts themselves rather than to the railways against which that federal statute thus far has been unduly, if not illegally, levelled?

THE PEOPLE AS RAILWAY INVESTORS.

IT is cheering to discover that at last the real public investment in the railways is beginning to draw more attention. Heretofore, in the popular view, capitalization, plant, directorates, the railway as an entity and body corporate have masked the army of direct stockholders who fundamentally are *the* railway corporation. But behind that body is another far greater multitude of stockholders, secondary and indirect, the stockholders once removed. The vast majority of them—more's the pity—do not realize that they are railway investors even in a remote sense. Yet through the medium of other corporations a large part of whose assets are in railway securities these secondary investors acquire a positive railway interest. Indeed, it is doubtful whether their average interest does not exceed that of a direct stockholder—or bondholder. One man holds a railway bond of $500. Another man has his hard-earned dollars in the form of a deposit of $1,500 in a savings bank, one-third of the assets of which is in railway bonds. Where is the real difference between the two?

There are two kinds of corporations which are the chief mediums of this secondary investment of the people in the railways: insurance companies and savings banks. Assessment and fraternal companies being excepted, the people who take out life and fire insurance—referring now to the so-called working classes—undoubtedly represent a class somewhat better off than the group of savings banks depositors. But they are practically identical in kind. It is unfortunate that the insurance returns do not summarize the corporate investment in railways so as to give a measure of the railway interest of the policyholders. Still, from the latest returns available, one may direct attention to the $3,380,294,090 of assets of the mutual life insurance corporations with their 25,852,406 policyholders; to the $122,606,460

assets and 8,589,711 membership of the assessment companies; to the $611,896,763 of assets of the mutual and stock fire companies, besides the large assets of the accident, surety and other corporations in the minor insurance group. Estimating all the assets of the insurance companies at $4,500,000,000, the inquiry as to what proportion of them are railway securities becomes difficult, but a rough approximation may be reached. Under date of Jan. 15, 1909, the Insurance Department of New York State gives a list of all securities held by life, fire and casualty companies doing business in New York State and Massachusetts. The sets of securities are some 13,000 in number, counting the different sets issued by the same corporations, including the municipalities. Of these the railway securities form about one-fifth. Applying that ratio to all the insurance companies, a total railway investment of about $900,000,000 is indicated. This is undoubtedly too low. It is very much too low for the great vested insurance interests, for example, of Connecticut; moreover, the general returns for the company are incomplete. But the minimum figure is big enough to suggest the absolute vastness of the policyholder's indirect railway interest.

Coming to the savings banks, the returns are more definite, though not so recent as we could wish. The figures of the United States treasurer for 1909 give total resources of the mutual savings banks of the country as $3,394,926,005, with $743,425,893 invested in railway bonds alone, and with 7,204,579 depositors. About 22 per cent. of the resources were thus in railway bonds. The returns of the comptroller of the currency for the previous year for savings banks of all kinds give the smaller percentage of somewhat more than 16 per cent. in railway holdings, and 8,088,866 depositors. In the case of depositors in all savings banks returns it must, of course, be remembered that each deposit in a separate bank counts as a "depositor," which thus, in the case of multiple deposits by a single depositor, increases the total number. In the comparative returns of the comptroller of the currency may be noted the increase of savings banks investments in the railways from $291,978,055 to $618,193,415 in five years. Railway investments considerably more than doubled, while the resources of the savings banks increased only about one-fifth.

The total of railway investments held as security for savings bank depositors and insurance policyholders thus by one rough, (but, in such large figures, approximately correct) computation amounts in round numbers to $1,643,000,000. Beyond lie the great investments in railways by the trust companies and by institutions of education and charity. About half, for example, of Yale University's total investment of some $13,000,000 is in railway securities. Beyond still are the large holdings of individual investors. But, excluding these, the indirect railway investments of the people in the various intermediary holding corporations probably amount up to $2,000,000,000 as a minimum, or, say, 15 per cent. of all steam railway stock and bonds outstanding and about 36 per cent. of the outstanding railway bonds alone.

The time has come when this huge public investment in the railway companies should stand out not only before the people, as a nation, but before the eye of the "indirect" railway investor as an individual. Hitherto the workingman has really not seen it at all. He has recognized often enough the character of the railway as a medium of labor; almost never its secondary relation to him as a small capitalist. At the very moment when he may be listening sympathetically to the utterance on the stump of some anti-railway shouter he may be a policyholder or a savings bank depositor, or both, yet utterly oblivious of his own personality as a man with a genuine railway interest—just as he is ignorant of the impact on him of certain indirect taxes. Not a great many years have passed since, in the free silver political campaign of 1896, the reasoning based on the effect on the savings banks investments of a diluted standard of the currency was an argument as effective as it was oft repeated. With jeopardy of the railway investment substituted for jeopardy of the currency the argument can fitly be repeated now.

ST. LOUIS & SAN FRANCISCO.

EVEN before the St. Louis & San Francisco separated from the Chicago, Rock Island & Pacific, the two roads were operated in many departments independently of each other, and "for the good of the service" there was a considerable rivalry between the officers and employees of the two properties as to which could make the best showing. The 'Frisco and the Rock Island are not similar enough in their geographical position, or in the nature of their traffic, to make a comparison between the two roads accurate or close, but certain statistics of each road make an interesting comparison with the other, and this is especially so this year because in December, 1909, the controlling interest in the stock of the St. Louis & San Francisco, which had been held by the Rock Island, was sold to B. F. Yoakum and associates, and joint officers were discontinued in the executive, legal, financial and operating departments. For seven months of the last fiscal year the two properties were run entirely independent. Of course, the annual report of the 'Frisco, just out, covers not only the seven months that the 'Frisco was operated independently of the Rock Island, but also the five months of joint operation.

The 'Frisco serves Kansas, Missouri, Arkansas, Tennessee and Oklahoma, and taps Texas. It will be seen, therefore, that there is no part of the 'Frisco that corresponds to the Rock Island lines running between Chicago and Colorado Springs and north thereof. The 'Frisco operates 5,071 miles, while the Rock Island operates 8,044 miles. On neither road was any considerable mileage added in 1910; in fact, the 'Frisco showed a slightly less mileage operated, due to remeasurement. Gross operating revenues amounted to $41,200,000 for the 'Frisco in 1910, an increase of $3,400,000, or 9 per cent., comparing with an increase of 8 per cent. in total operating revenues on the Rock Island. Per mile of road the 'Frisco earned $8,117 in 1910 and the Rock Island earned $8,233.

Operating expenses of the 'Frisco last year amounted to $28,700,000, an increase of $3,900,000 over 1909. This is an increase of 15 per cent., comparing with an increase of 13 per cent. in operating expenses on the Rock Island. Per mile of line, the operating expenses of the 'Frisco last year averaged $5,654; on the Rock Island, $5,976. In a normal year, the 'Frisco has a considerable advantage in having on its own lines large coal fields from which it is able to get its own fuel, while the Rock Island ordinarily has to haul its fuel for considerable distances, although it has some coal in the neighborhood of Choctaw, Okla. Last year, however, owing to the strike in the coal mines in Missouri, Kansas, Arkansas and Oklahoma, the 'Frisco was compelled to haul its coal from Indiana, Kentucky and Alabama, so that its fuel costs were more nearly comparable to those of the Rock Island than they were in previous years.

As far as division of revenue is concerned, the Rock Island and the 'Frisco are much alike. Sixty-seven per cent. of gross revenue came from freight on the 'Frisco last year, comparing with 64 per cent. from freight on the Rock Island. Freight density is also much the same on both roads. In 1910 the average ton mileage per mile of road on the 'Frisco amounted to 557,886, and on the Rock Island to 567,792. The 'Frisco showed an increase of 61,314 ton miles per mile, and the Rock Island 49,398. The average revenue per ton per mile on the 'Frisco last year was 9.8 mills, a decrease of .2 of a mill from 1909. The revenue per ton per mile on the Rock Island is somewhat lower, averaging last year 9.2 mills, which was somewhat less than it received in 1909.

As might be expected, the 'Frisco, not having any *long* through route comparable to the main line from Chicago to Colorado Springs on the Rock Island, gets a much shorter average haul of freight. This average haul in 1910 was 158.69 miles on the 'Frisco and 238.28 miles on the Rock Island. The Rock Island shows a slightly better average train load, amounting in 1910 to 257 tons, as compared with the 'Frisco's 223 tons; but on the other hand, the 'Frisco's train load in 1910 was two tons greater than in 1910, while the Rock Island's was seven tons less. The

Frisco's car loading is better than that of the Rock Island, the revenue freight per loaded car mile averaging 17 tons last year as against the Rock Island's 15 tons.

The explanation of the heavier car load is possibly to be found in the fact that a much greater proportion of the 'Frisco's traffic is products of mines and lumber than is the case with the Rock Island. The following table shows the percentage of the tonnage of each class of commodity to the total tonnage carried, and shows the percentage of increase of tonnage of each class over the previous year:

	Frisco		Rock Island	
	Percentage of total.	Percentage of increase or decrease.	Percentage of total.	Percentage of increase or decrease.
Products of agriculture	14.80	3.69	22.13	—1.03
Animal products	3.47	1.33	7.08	2.04
Products of mines	40.41	12.31	31.93	21.88
Products of forests	20.72	7.67	12.34	9.73
Manufactures	15.44	29.21	19.55	20.42
Miscellaneous and merchandise	5.16	12.21	6.97	7.81

Returning to operating expenses, we find much the same general influences at work to increase the cost of operation on the 'Frisco as on the Rock Island; remembering, however, that the strike of coal miners affected the 'Frisco probably more closely than it did the Rock Island. The 'Frisco had an operating ratio last year of 69.66 per cent., comparing with 65.57 per cent. in 1909 The Rock Island's operating ratio in 1910 was 72.59 as against 69.48 in 1909. Transportation expenses on the 'Frisco totaled $14,700,000, an increase over 1909 of 12 per cent., and consumed 35.70 per cent. of gross revenue. On the Rock Island transportation expenses were 10.27 per cent. higher than in 1909, and consumed 38.05 per cent. of total operating revenue. Since the ratio of freight revenue to total revenue is much the same on both roads, and since traffic density is also not widely different, a rough comparison of operating costs may be made by comparing the transportation expenses per ton mile on the two roads. Since it is impossible to separate freight and passenger expenses, the figure taken is total transportation expenses and is divided into the total ton mileage. This gives a transportation per ton mile expense of 5.2 mills on the 'Frisco and 5.5 mills on the Rock Island.

In 1910 there were large sums spent on maintenance, both of way and of equipment, on the 'Frisco, as will be seen from the table at the end of this article, showing a comparison between the operations of the 'Frisco in 1910 and 1909. The following table gives the unit costs of maintenance in 1910 and 1909 of both the 'Frisco and the Rock Island:

	Frisco		Rock Isld.	
	1910.	1909.	1910.	1909.
*Main. of way and structures per mile	$1,130	$979	$1,373	$1,146
†Maintenance of locomotives	3,167	2,604	2,530	2,529
" " passenger cars	765	612	820	801
" " freight cars	67	54	80	68

*Per mile of main, first, second and third track.
†Includes repairs, renewals and depreciation, but no overhead charges.

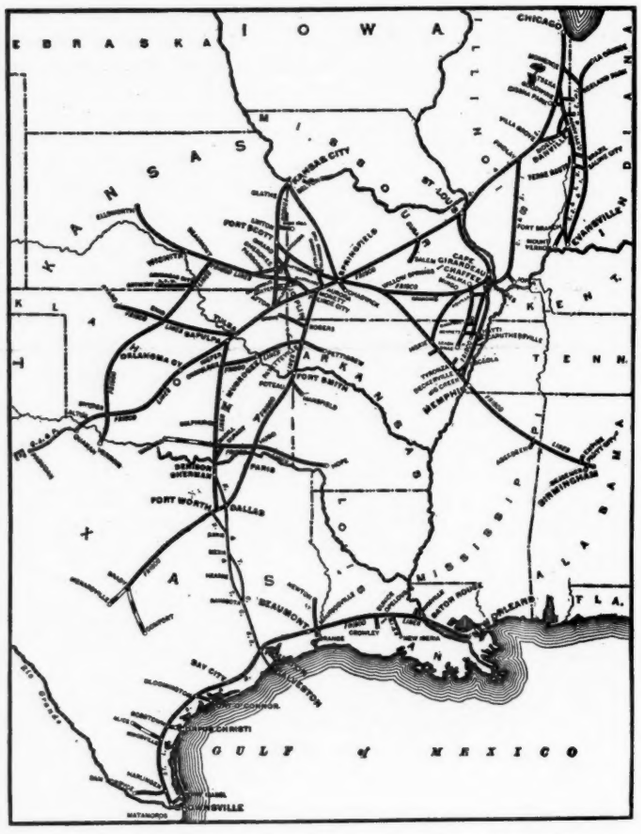
One explanation why the 'Frisco's repairs per locomotive have increased so much in the past year may lie in the fact that its new shops at Springfield have very recently been put in operation; and when new shops are first put in operation there is a marked increase in the unit costs of repairs. Presumably also, of course, the 'Frisco kept its locomotives and rolling stock in better repair in 1910 than it did on 1909.

In his discussion of maintenance, President Winchell says of the 'Frisco: "Your company's property is receiving a substantial improvement in value by reason of the number of treated ties (creosote treatment) which are being put into the track, at an increased expense, borne by maintenance charges. This work was begun late in 1907; as of date June 30, 1910, more than 3,000,000 creosoted ties had been used, at an additional cost for treatment and handling of more than $1,000,000. The life of these treated ties is estimated at 15 years or more, or approximately two and one-half times the average life of the untreated ties; the benefit to the property in reduction of maintenance charges on this account will not be noticeable for several years."

To make a comparison of the funded capitalization of the 'Frisco and the Rock Island it is necessary to add to the bonds of the Chicago, Rock Island & Pacific Railway Co. the funded debt of the Rock Island Co. Making this adjustment, we find that the St. Louis & San Francisco has funded debt and equipment notes and bonds outstanding at the rate of $44,154 per mile of line owned, and the Rock Island has funded debt and equipment notes of $41,736. The interest charges per mile of line on the 'Frisco are $2,001; and on the Rock Island, $1,824.

The balance sheet of the St. Louis & San Francisco indicates that the company will have to do some more financing as soon as conditions in the bond market warrant it.

On June 30, 1910, the company had $29,990,000 current assets, which, however, includes cash on deposit to redeem $6,000,000 bonds called for redemption. The cash in treasury and in hands of fiscal agents amounted to $5,700,000, an increase over 1910 of $600,000. Current liabilities totaled $22,200,000, which includes the $6,000,000 bonds called for redemption, but also includes $6,000,000 notes payable. This is an increase of $4,300,000 in notes payable, and it seems obvious that in time these notes will have to be funded.



St. Louis & San Francisco and Chicago & Eastern Illinois.

During the year the company sold, in all, $37,267,871 bonds and retired $14,689,000, leaving a net increase of $22,578,871 in the funded debt. The 'Frisco is burdened with a large mileage of unprofitable branch lines, the financing of which has been a strain on the credit of the company; and the company now finds it costly to carry out additional financing for the improvement and betterment of its main line and branches, and for the retirement of maturing bonds and notes. In accordance with the Interstate Commerce Commission's prescribed practice, the 'Frisco charged to profit and loss in 1910 that year's proportion of the discount on securities sold, which amounted to $480,000. In addition to this, there is carried on the asset side of the balance sheet $9,800,000 discount on bonds carried in suspense, to be charged out in annual installments. This sum has increased since 1909 by $4,900,000. In bookkeeping, of course, there is a distinction between carrying an account in suspense and charging the sum out to profit and loss, just as in book-

keeping this sum is shown on the asset side of the balance sheet; but, laying bookkeeping technicalities aside, this $9,800,000 is a loss; or is part of the cost of new construction and additions and betterments, in so far as the proceeds of the bond sales were used for these purposes.

Speaking of theories, it is refreshing, after the long theoretical discussions of freight rate advances, to find some figures bearing directly on this subject given in an annual report which are based on mathematically demonstrable facts.

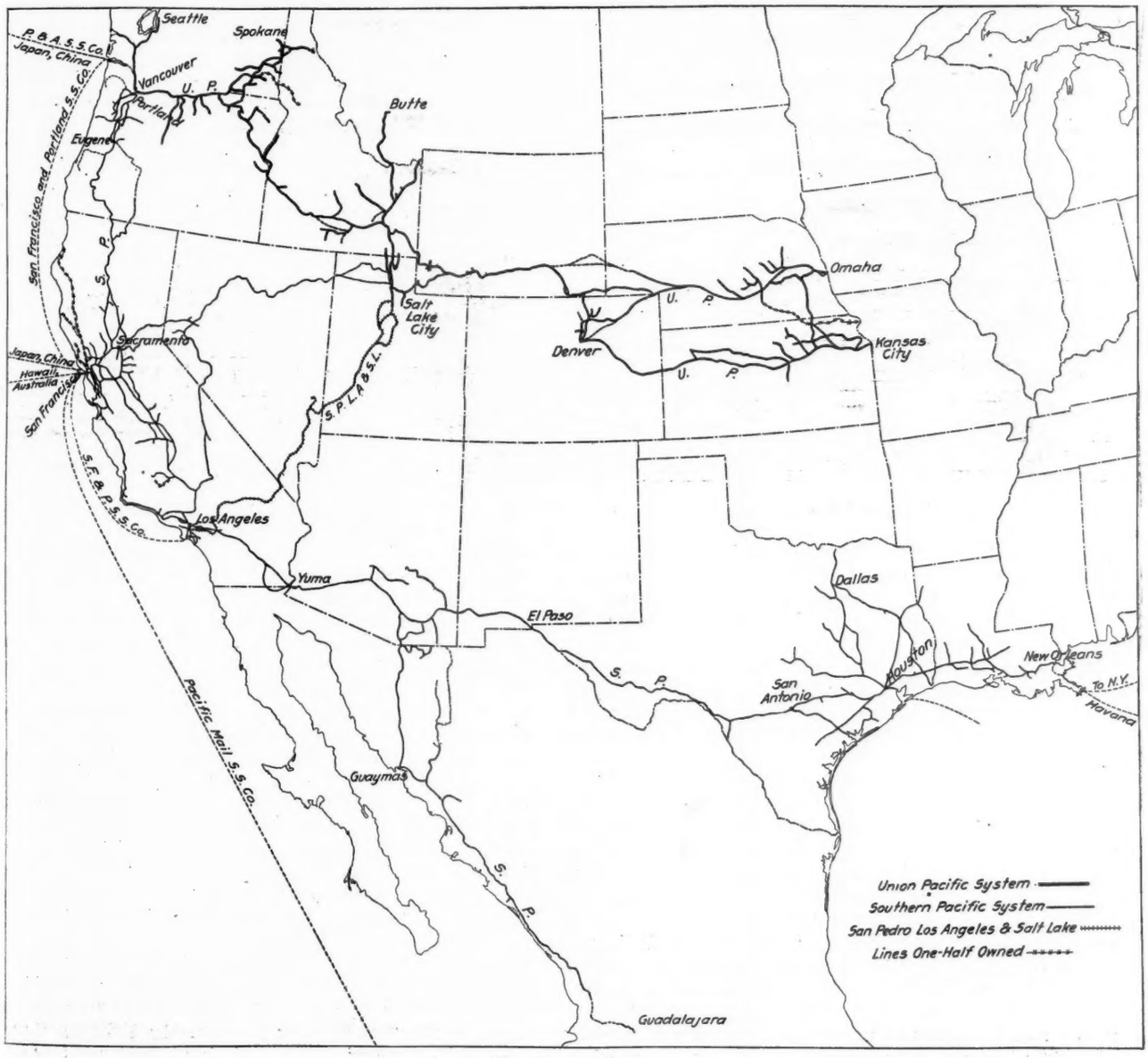
President Winchell says: "Much has been said of late respecting the obvious necessity of greater compensation for the railways per unit of service rendered. In this connection it has been frequently stated that, within the past few years, rates have already been raised and that the actual rate basis is now higher than in the recent past. Figures refute this so far as 'Frisco is concerned. On our 1910 ton miles, if we had received the rates of 1907, our freight revenues would have been larger by $933,729; at the rates of ten years ago, 1900, we would have had $2,291,881 more freight earnings. Our passenger rate per mile in 1907 applied to our 1910 passenger miles would have yielded us a further increase of $1,669,812. If the railways are to serve the public adequately, net revenues must be preserved or increased by means of better rates and not by poorer maintenance; the public cannot afford the latter method."

The following table shows the operations of the 'Frisco in 1910 compared with 1909:

	1910.	1909.
Average mileage operated	5,072	5,073
Freight revenue	$27,645,863	$25,262,516
Passenger revenue	10,548,970	9,603,340
Total operating revenue	41,165,939	37,756,986
Maintenance of way and structures	5,778,268	4,987,633
Maintenance of equipment	5,940,310	4,596,862
Traffic	1,136,821	873,292
Transportation	14,689,094	13,103,878
Total operating expenses	28,876,842	24,760,091
Taxes	1,458,186	1,532,149
Operating income	11,030,911	11,464,746
Gross corporate income	13,331,340	12,919,772
Net corporate income	1,121,559	1,514,376
Dividends	199,742	199,742
Surplus	922,217	1,314,634

UNION PACIFIC.

IN times past the operations of the Union Pacific as a speculative investor have often held such a dramatic interest that they overshadowed the interest in the operation of the Union Pacific as a transportation plant, but this was by no means the case in the fiscal year ended June 30, 1910. The report for this year is the report of a railway company, and about the only interest that attaches to it as a report of a banking company lies in the negative information given that there has been almost no change in Union Pacific's holdings of investment stocks. The two busi-

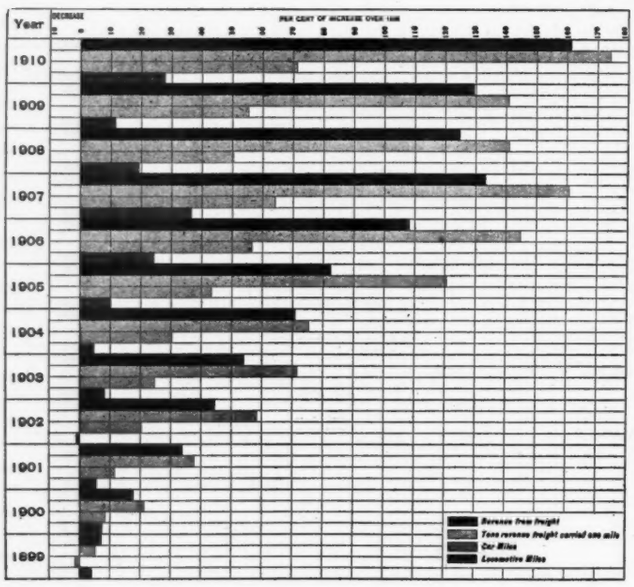


Harriman Lines.

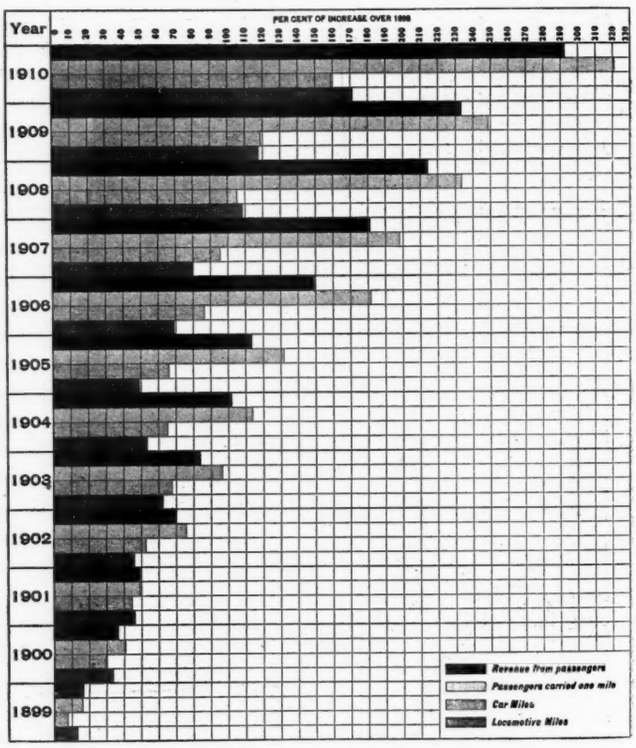
nesses, that of investor and that of railway company, are quite distinct in so far as direct earnings are concerned, and the management emphasizes this fact by declaring 6 per cent. dividends on Union Pacific common stock, payable from the earnings of the company as a transportation concern, and 4 per cent. additional, payable from the earnings of the company as an investor. But it is neither interesting nor correct to lose sight of what has been attained through the use of Union Pacific credit in building up a great system of railways and gaining a representation in the management of others. Both a study of the accompanying map, which shows the Southern Pacific as well as the Union Pacific, and even a casual reading of the testimony recently summed up in the Union Pacific and Southern Pacific merger case, show how fundamental is the connection between the operation of the transportation plant and its relation with other roads, gained through those Harriman and Union Pacific activities which might be termed "speculation."

Last year the Union Pacific earned a total surplus from both transportation and investment of $19,800,000, as against $17,900,000 in 1909.

In 1910 the Union Pacific carried a total of 15,300,000 tons of revenue freight and 8,300,000 passengers. On an average it



Freight Service and Traffic.



Passenger Service and Traffic.

hauled each ton of freight 346 miles and each passenger 116 miles. This is an increase of 1,600,000 tons in total tonnage and 1,100,000 in the number of passengers. Stated in percentages, 1910 showed an increase of 11.56 per cent. in freight tonnage over 1909 and 15.52 per cent. in the number of passengers carried. The average haul of the Union Pacific for both freight and passengers is very long; for instance, the average haul of freight on the Great Northern, a transcontinental competitor, was 245 miles in 1910, and the average distance each passenger was carried was 78 miles.

The ton mileage of revenue freight totaled 5,997,000,000 in 1910, an increase of 13.87 per cent. over 1909, and the revenue per ton per mile was 1.024 cents, which is less by .001 of a cent than the average revenue in 1909. Total freight revenue amounted to $61,500,000 last year, as against $54,000,000 in 1909.

The principal changes in the character of commodities carried are decreases in the proportion of products of agriculture, products of animals and products of mines, and increases in the proportion of tonnage furnished by forest products, by manufacturers and by merchandise. In 1910, 33.89 per cent. of the total tonnage carried by the Union Pacific was products of mines; 23.55 per cent. products of agriculture; 14.31 per cent. products of forests; 13.93 per cent. manufactures; 7.90 per cent. merchandise and miscellaneous, and 6.42 per cent. live stock and animal products. Every one knows how diversified is the Union Pacific's traffic, but comments on the company's report are incomplete if they fail to call attention to this so important fact in the operation of the road. There are ten general classes of commodities, each one of which furnishes more than half a million tons of traffic yearly to the Union Pacific. In 1910 manufactures furnished 2,100,000 tons of traffic. This is an increase over 1909 of 467,000 tons, or 28 per cent.

Passenger business increased over 1909 in even greater proportion than freight business. Last year the company handled 961,000,000 revenue passenger miles, more by 21 per cent. than was handled in 1909. The revenue per passenger per mile averaged 2.122 cents in 1910 and 2.169 cents in 1909, so that the total revenue from passenger trains was not as much greater in proportion to 1909 as was the passenger mileage. Last year the company earned from passenger trains $25,300,000. This is $3,300,000 more than was earned from the same source the year before, and the increase is about 15 per cent.

The freight and passenger traffic statistics, compared with car mileage figures, show, as has been pointed out before, that in general it is much easier to handle an increased freight tonnage with proportionately smaller car mileage increase than it is to handle increased passenger traffic. With ton mileage greater by 14 per cent. last year than the year before, the total freight car and caboose mileage totaled 441,000,000 miles, which is but 10.21 per cent. greater than the car mileage in 1909. On the other hand, with an increase of 21 per cent. in passenger mileage, passenger car miles totaled 95,200,000, or 18.33 per cent., more than in 1909. The average train load of freight in 1910 was 548 tons, which is almost exactly the same as in the year before. The percentage of loaded car mileage to total car mileage, however, was 76.30 per cent. last year, compared with 75.14 per cent. the year before.

With the greater train movement and with the increased cost of labor and also of fuel, operating expenses ran up considerably above what they were in 1909. Total operating expenses last year were $46,900,000, which is greater by $8,990,000 than the operating expenses in 1909. This is an increase of 23.70 per

cent., comparing with an increase in gross revenue of 14.57 per cent. Of the expenses of the rail lines, maintenance increased $3,900,000, or 25.53 per cent., and operation $4,800,000, or 21.37 per cent. In operation is included traffic expenses and general expenses as well as transportation expenses. The cost of maintenance of way and structures was $9,900,000, an increase of $2,200,000 over 1909. Judge Lovett says that the increases in these expenditures resulted principally from the expenses incident to maintaining 323 miles of additional main tracks and 78 miles of sidings, renewal of a much greater number of ties, the higher wage schedules and from charges under the rules of the Interstate Commerce Commission for property abandoned, formerly charged to profit and loss. He says that, although the charge for increase in weight of rails to additions and betterments instead of to operating expenses had been the previous practice of the Union Pacific and had resulted in a diminution of the charge for rails put in track, the cost of labor in making these renewals, which exceeded by 18.86 miles the rails put in track last year, is included in the expenses.

The following table shows the unit costs of maintenance:

	1910.	1909.
*Maintenance of way	$1,458	$1,185
†Repairs per locomotive	3,593	3,107
" of passenger train cars	1,184	1,124
" per freight train car	92	93

*Per mile of all main tracks.
†Repairs only. Renewals and depreciation are excluded.

The Harriman lines spend very large sums on repairs of equipment and keep their equipment in correspondingly good condition. During 1910 there was a net increase of 46 locomotives in service, 114 passenger train cars and a decrease of 421 freight train cars in service. On June 30 there were 28.93 per cent. of the locomotives in service in thorough order; 41.71 per cent. in good order; 18.34 per cent. requiring repairs, and 11.02 per cent. in shop.

Besides the sums spent for maintenance and charged to operating expenses, the Union Pacific spent last year $9,000,000 on additions and betterments to roadway and track; $1,300,000 on additions and betterments to buildings, and a net sum of $1,060,000 for new equipment—a total, after minor adjustments, of $14,800,000.

The balance sheet, or, as the company prefers to call it, the statement of assets and liabilities, is a reflection of the conservative policy of the present management. The company had on June 30, 1910, $75,000,000 current assets, which included $9,100,000 cash in the treasury and $27,450,000 demand loans and time deposits, which are, of course, cash assets. Current liabilities totaled $23,800,000, which included $12,800,000 dividends payable July 1 and October 1. During the year the Union Pacific loaned to the Southern Pacific $10,900,000. The only change in funded debt and capital stock outstanding was the sale of $4,900,000 first lien and refunding 4 per cent. bonds and the conversion of $30,231,950 par value Union Pacific convertible bonds into common stock. These bonds are convertible at 175 in bonds for $100 par value stock, so that through this conversion the profit and loss account of the company shows a credit of $12,956,550.

The following table shows the operations of the Union Pacific in 1910, compared with 1909:

	1910.	1909.
Average mileage operated	6,292	6,062
Freight revenue	$61,479,680	$54,000,195
Passenger revenue	20,814,820	17,672,357
Total operating revenue	90,228,092	78,750,462
Maintenance of way and structures	9,915,482	7,682,146
Maintenance of equipment	9,061,519	7,434,599
Traffic	1,985,018	1,563,031
Transportation	22,205,807	17,914,909
Total operating expenses	46,938,909	37,945,086
Taxes	3,264,348	2,570,562
Operating income	40,024,835	38,234,814
Net income from transportation operations	25,993,639	23,862,008
Dividends	17,004,320	15,788,820
Income from investment, etc.	19,512,051	17,736,393
Dividends payable from investment earnings	8,681,546	7,871,331
*Surplus	19,819,825	17,938,250

*Total, including both surplus from transportation and operations from investment earnings.

CHICAGO & EASTERN ILLINOIS.

THE 14.4 per cent. increase in total operating revenue earned by the Chicago & Eastern Illinois this year came from the nearly equal proportionate increase of tonnage of each class of commodity carried. Bituminous coal, with an absolute increase of 975,000 tons, or 17 per cent., furnished 56.86 per cent. of the total tonnage, as compared with 58.79 per cent. in 1909, while the changes in relative proportions of tonnage of other classes of commodities were much less.

Efficient operation saved 31 per cent. of the increase in earnings for net operating revenue, without skimping expenditures for maintenance. Loaded freight car miles increased from 58,580,000 to 67,930,000, while empty mileage only increased from 36,420,000 to 39,030,000. Revenue freight ton mileage was 1,993,800,000, an increase of 311,700,000, and passenger mileage was 106,700,000, an increase of 11,000,000. The revenue freight train load increased from 554.9 tons to 572.1 tons, and the average haul decreased slightly, from 166.87 miles to 164.28 miles. Revenue per ton mile fell from 0.48 cents to 0.46 cents. The income account is as follows:

Year Ended June 30, 1910, Compared with Previous Year.

	1909-10	1908-09	Increase or Decrease Amount	Pr. Ct.
Average mileage operated	965.68	965.68	.....	....
Operating Revenue:				
Freight	$9,258,496.30	$8,005,582.87	$1,252,913.43	15.7
Passenger	1,867,174.40	1,666,981.00	200,193.40	12.0
Mail	123,283.13	123,001.47	281.66	.2
Express	298,386.10	277,606.03	20,780.07	7.5
Miscellaneous	142,254.19	118,127.04	24,127.15	20.4
Total revenue from transportation	$11,689,594.12	$10,191,298.41	$1,498,295.71	14.7
Revenue from operation other than transportation	60,761.47	78,320.58	—17,559.11	22.4
Total operating revenue	$11,750,355.59	$10,269,618.99	$1,480,736.60	14.4
Operating Expenses:				
Maintenance of way and structures	$1,153,929.36	$994,709.67	$159,219.69	16.0
Maintenance of equipment	2,043,376.45	1,663,759.23	379,617.22	22.8
Traffic expenses	267,411.73	210,011.47	57,400.26	27.3
Transportation expenses	4,096,671.24	3,635,685.77	460,985.47	12.7
General expenses	392,595.06	430,367.37	—37,772.31	8.8
Total operating expenses	$7,953,983.84	$6,934,533.51	$1,019,450.33	14.7
Net operating revenue	$3,796,371.75	$3,335,085.48	$461,286.27	13.8
Taxes	362,124.30	274,114.66	88,009.64	32.1
Operating income	$3,434,247.45	$3,060,970.82	$373,276.63	12.2
Miscellaneous income:				
Outside operations	*$16,191.03	*$19,942.23	$3,751.20	18.8
Hire of equipment	139,705.00	61,994.60	77,710.40	125.3
Other income	619,108.34	543,551.10	75,557.24	13.9
Total miscellaneous income	$742,622.31	$585,603.47	$157,018.84	26.8
Total income	$4,176,869.76	$3,646,574.29	$530,295.47	14.5
Interest	$2,229,077.10	$2,192,171.66	$36,905.44	1.7
Rentals	772,002.50	759,231.69	12,770.81	1.7
Total charges	$3,001,079.60	$2,951,403.35	$49,676.25	1.7
Available for dividends.	$1,175,790.16	$695,170.94	$480,619.22	69.1
Dividends	1,107,266.00	674,198.00	433,068.00	64.2
Balance transferred to profit and loss	$68,524.16	$20,972.94	$47,551.22	226.7

DIVIDENDS DECLARED DURING YEAR ENDED JUNE 30, 1910.

Dividend No. 84, 1½ per cent. on preferred stock, paid October, 1909	$132,460.50	
Dividend No. 85, 1½ per cent. on preferred stock, paid January, 1910	132,460.50	
Dividend No. 86, 1½ per cent. on preferred stock, paid April, 1910	132,460.50	
Dividend No. 87, 1½ per cent. on preferred stock, paid July, 1910	132,460.50	
Total dividends declared on preferred stock, 6 per cent		$529,842.00
Dividend No. 23, 5 per cent. on common stock, paid December, 1909	$360,890.00	
Dividend No. 24, 3 per cent. on common stock, paid June, 1910	216,534.00	
Total dividends declared on common stock, 8 per cent		577,424.00
Total		$1,107,266.00

*Debits.

Letters to the Editor.

THE OLDEST RAILWAY IN SOUTH AMERICA.

State Railways of Chile,
Santiago, Chile, August 30, 1910.

To the Editor of the Railway Age Gazette:

In your issue of June 17, 1910, p. 1570, you say: "This will give Paraguay its first connection with the outside world by rail, although the Paraguay Central is the oldest railway in South America."

This statement, please, sir, is not correct. The oldest railway in South America is here in Chile, between Caldera and Copiapo. It was constructed by an American, William Wheelwright, having as chief engineer W. W. Evans, also an American. The first train arrived at Monte Amargo, km. 41, on July 4, 1851. and it was driven by the engine "The Copiapo," from the Norris Works, Philadelphia, Pa. The first train arrived at Copiapo, km. 81, on December 25, 1851. On January 1, 1855, the railway reached Pabellon, km. 119, and on February 1, 1867, it reached San Antonio km. 140, the terminal of the line.

EDUARDO SOUBLETTE.

MORE REGULATION FOR AUTOMOBILES.

September 24, 1910.

To the Editor of the Railway Age Gazette:

I read with interest your comments in your issue of September 16 on the accident in which two people were killed by an automobile, in which you raised the question of the condition and qualities of the tires, also the virtues of the chauffeur and the owner of the machine. I am sorry you did not go further and raise a number of other questions which this naturally suggests:

For instance: A number of the states require a man to fire a locomotive at least three years before he can be promoted, and then he must stand a strict examination. Then he has to run a freight engine a required number of years before he can run a passenger train. Locomotive boilers must be inspected by state inspectors; if a railway has a small pump boiler some place of 15 or 20 h.p. we have to have for it a licensed engineer with a certificate from a state board of examiners. Some cities will not permit motormen to handle street cars until they have had a required amount of experience. Our factory and sanitary inspectors require us to adopt sanitary measures on railways and in our cities. It is a misdemeanor to expectorate on the floor of a passenger coach or on the sidewalks of a city, on account of the probabilities of bacteria spreading among us.

How do those things compare with the requirements regarding people operating automobiles? We put them in the hands of boys 12 to 20 years of age, who are too young to have calm judgment, or so-called "chauffeurs," whose character, education, etc., are questionable. Without any track to stay on, these young fellows run pellmell over the highways and byways seeking whom they may devour with machines of from 20 to 60 h.p. A goodly part of the garages are operated by men claiming to be mechanics, who four or five years ago were somebody's footmen or blacksmiths—anything but what they claim to be, and the dear public is paying a very exorbitant price for their education—or, rather, for the education of both the repairmen and the public.

Is it right or sane for public officers, who have the welfare and safety of the community in their charge, to permit automobiles to be handled by boys and girls who have no sense of danger or responsibility, and by a lot of speed maniacs who absolutely have no judgment as to the rate they should travel? If some idiot gets on a locomotive and starts down the track everybody can get out of his road. People who are reputed to be of sane mind take chances on automobiles that a railway man would not dream of in his wildest moments.

Looking at the matter from a sanitary standpoint, it is wrong to expectorate or put anything on the streets that is apt to breed bacteria. But is it any better for the pedestrian walking down the street to be treated to a dose of gasoline and burnt oil and to have the bacteria on the street stirred up by the automobiles and blown in his face?

We are regulating many things nowadays, and it would seem that it is timely that a commission be inaugurated to regulate the use of the automobile. The most surprising thing to the writer is that Representative Joshua Pumpkinville has not already been active in efforts to secure stringent regulations of them similar to that of railways. It would not only be a good thing for the public as regards safety, but it would be a good way for the politicians to create places for a few constituents, such as inspectors of automobiles, etc.

RAILWAY MASTER MECHANIC.

REPORTING REVENUE ON EXCHANGE TICKET ORDERS.

To the Editor of the Railway Age Gazette:

A considerabe proportion of through passenger business is now handled on a form of ticket containing passage coupons to a point of interchange and an exchange order drawn on a connecting carrier for a ticket to be issued without collection of money for the balance of the journey. This arrangement, while reducing the number of printed ticket forms with which agents are supplied, is an inconvenience to passengers. It also works an injustice against some carriers which, because of their geographical location, are required to honor a great many more exchange orders than they sell. Carriers selling a large number of exchange orders and honoring comparatively few, force upon the exchanging carriers and on patrons much expense and annoyance.

Complaints which have been made indicate that the method of reporting revenue on exchange orders, which was satisfactory for a small amount of business, does not properly care for the great volume that is now transacted. "Recognized methods" were completely demoralized by the amount of westbound exchange business through Chicago, St. Louis and Kansas City during the tourist season of 1909, and the resulting confusion of accounts still remains unsettled.

The practice has been for the carrier selling the exchange order to report to the carrier on which the order is drawn all revenue accruing beyond the point of exchange. By the time that the exchanging carrier has received and is able to reapportion this revenue, some of the carriers honoring the tickets have waited several months for their share of the revenue. This misplacement and delay in reporting a great amount of revenue unnecessarily impairs the integrity of accounts and causes expense. The road selling an exchange order thrusts upon carriers honoring it the responsibility and expensive labor of issuing a second ticket and reapportioning revenue for which they should not be held responsible.

The fact that these conditions have long existed does not excuse them, although the carriers profiting by this "legitimate graft" may oppose changes on that ground.

In endeavoring to make the best of present conditions the accounting departments of a number of carriers have recently arranged to report revenue on exchange orders the same as if proper coupons had been sold through to final destination. The carriers exchanging the orders report a description of them in lieu of revenue on tickets issued in exchange therefor, thus placing the revenue where it belongs through the proper party and much more promptly than was possible under the old arrangement.

Carriers opposing the necessary changes should either withdraw their opposition or give a reason for their position, so that they may be properly dealt with, and an equitable and uniform system be adopted.

H. C. EDMISTON.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.

The annual meeting of the Society of Railway Financial Officers was held at Old Point Comfort, Va., on October 25 and 26. The meeting was the most largely attended that has been held by the society since its organization. The subjects of clearing house settlements and credit and voucher forms received particular consideration. A mileage of 172,551 miles is now represented in the society, which includes nearly all the important railway systems in North America.

The following papers were read: "The Formation of a Clearing House," Arthur Hale, general agent of the American Railway Association; "Watered Stock," George H. Crosby, vice-president of the Rock Island; "Short Term Notes," J. V. McNeal, vice-president of the Baltimore & Ohio; "Systems of Paying Interest Coupons and Registration of Same," P. W. Bigoney, treasurer of the Erie; "The Financial Outlook," E. L. Rossiter, treasurer of the New York Central; "Some Features of Railway Finance," Frank Scott, treasurer of the Grand Trunk; "Clearing House Settlements," F. H. Hamilton, secretary and treasurer of the St. Louis & San Francisco.

George H. Crosby, vice-president of the Rock Island, in his paper on "Watered Stock," said, in part:

"Investment in the stock of early railways was a problem in futures. It was purely speculative or was purchased as an inducement for the construction of the projected line through the desired sections, and the price realized for the stock was much below face value. After the earlier periods it developed that railways could not be built on the proceeds of the stock alone, and it became necessary to issue and market mortgage bonds. But the bonds of corporations in a comparatively new industrial field were not attractive as an investment, and to enhance the allurement for purchase it was frequently necessary to allot a certain proportion of stock with each bond, and even with this inducement and with the high interest rates then paid, the bonds could be sold only at large discounts.

"Gradually many of the railways began to earn dividends on their stock, small dividends, as the interest on the par value of the bonds sold at a discount had not only to be provided, but the hastily constructed roadways and obsolete structures needed rebuilding; wooden bridges were replaced by steel to safeguard the heavier traffic and, for the same reason the roads were ballasted. Small equipment gave way to cars and locomotives of larger capacity and heavier rails replaced the smaller or worn out types.

"In order that these betterments be provided, only a portion of the surplus available for dividends was paid to the owners of the stock, to those owners who had jeopardized the principal of their investment in their faith in the future of railways. The balance was put into needed permanent improvements.

"The amounts used from surplus income for improvements and extensions, the net earnings of the owners of the property, the stockholders, were applicable for dividends, but were diverted for capital uses, for the permanent betterment and growth and development of the railway properties.

"These improvements and extensions added the extent of their permanent value to the existing property and, the cost thereof having been temporarily diverted from the owners of the stock, these stockholders were, in various instances, later reimbursed by stock dividend; in some cases by a pro rata distribution, in more, at a certain cost per share of the new issues of stock, but less than the then prevailing market price.

"This action was properly taken in order that the owners of the stock should receive, in value, a portion of the net earnings which, although their just due, had been heretofore withheld for the needs and development of their properties, and that the outstanding amount of capital stock should more nearly represent existing value. Yet the gross values of these stock dividends only approximated the actual cost of permanent improvements made to the properties. The larger portion of additional stock issues were made directly for public consumption at fixed prices per share, the proceeds to be used for needed modern facilities, second, third and fourth tracks, new yards, new branches, and the extension of lines, without unduly increasing the fixed charges. Interest on bonds must be paid, but dividends only if earned.

"It became customary when the earnings justified the act, to set aside or appropriate from income, certain amounts for future improvements, and when these amounts had been expended on permanent additions or betterments it was eminently proper and according to the ethics of conservative business methods to capitalize such expenditures. But, hundreds of millions of dollars were placed in the permanent way, and in equipment, without corresponding increase to capital account, it having been railway practice for many years to charge to operation items of expenses these companies are now, under the interpretation of the law, compelled to capitalize. Had the present methods been followed from the inception of railways in this country, their capital account would now stand in vastly larger figures, and legitimately so.

"All railway properties have not been honestly handled. There have been multiplied cases of over-capitalization, of wrongfully issued stock dividends, of wasted earnings, of incompetence and criminal management. So it is in all branches of industry. But, I feel assured that the large majority of railway corporations have been managed with ever-constant and successful effort for the permanent betterment of the properties at a minimum of capital increase.

"Railway values have increased corresponding with the prosperity of the country they traverse.

"Railways have contributed more than any other cause to the so-termed 'unearned increment,' properly, the natural increment, and it is their just due that the enhanced worth of their properties from this reason be considered in their capital values.

"It is the firm belief of the unprejudiced students of the railway problem that, in money or labor, the face value of issued railway capital as now outstanding, has undoubtedly been paid, but were it not so, had the water in these securities been as claimed, yet has the country not been so greatly benefited, that a generous return on the investment should be cheerfully accorded by a grateful people? Men are not stimulated to engage in new ventures in untried fields by the prospect of so-termed reasonable profits, but by the hope of large returns, and the net returns from railway capital investments have been far from large, dividends on railway stock averaging now but approximately 4 per cent. per annum.

"Railways are a government creation and under its fostering care and it is now a frequent claim from press and platform that their stocks should not be permitted to yield a greater annual net revenue that 6 per cent., nothing being allowed for depreciation or renewals. So are national banks government creations and under government control, yet, without protest from the public they are yearly earning net revenues of more than twice 6 per cent."

Mr. Hamilton, in discussing the question of clearing house settlements, said:

"Now, for some years it has occurred to me that while all the rest of the world was making settlements by differences the plan of making settlements between railways, which was really devised by the Accounting Department Association, of drawing on each other for the balances, was a step toward the clearing house idea. But we are drawing and paying on each other, sometimes drawing and paying to the same city. Therefore, somebody is carrying between these two cities something to represent the dollars which the railways owe each other. At a certain stage of our experience it was the actual coin or the actual cur-

rency that had to travel between these two cities. Somebody is going to pay for it, and as the railways are instigating the exchange of credits they pay for it, either in dollars or the loss of economy. There has been in some cities the clearing house agreement that the railways as well as all others shall pay exchange charges. In other cities that is not so, but the time is coming, I think, sooner or later, when we may all be asked to pay exchange charges on what we collect, and I think you will all agree that if we can find a plan of settling differences instead of drawing on each other for the large amounts we will be saving some money, although it will never be made a matter of record. I hope we can get to it and devise some plan of accomplishing it. I think it can be done without turning our present custom inside out and without revolutionizing the world, but it will have the effect of simplifying things, and, I hope, of saving clerical labor from the outset. Possibly with some it will be warding off business expense."

Mr. Hale described the organization and methods of the American Railway Clearing House in clearing per diem balances.

Mr. Scott, in his paper on the financial outlook, took a hopeful view. He said in concluding:

"On this great continent the future success of railway investments is assured. Notwithstanding the uncertainties that at present exist, notwithstanding the undue burdens imposed for the time upon transportation companies, more intelligent thought is being concentrated on railway problems than ever before. The interests of the public are championed to the fullest extent by a host of representatives. The investor also has interests which must be conserved, and an adequate return made on the money contributed by him to the development of the country. His claims are being ably advocated by those who perceive in radical action inimical to the investor, not only the impairment of railway credit, but also an actual blow at the credit of the country. Out of the turmoil of inquiry and discussion it cannot be doubted that there will be eventually evolved a stability and security in railway investments far exceeding anything existing hitherto. Underlying all the vicissitudes of railway financial endeavor certain broad principles must be formulated and followed by railway companies, both individually and collectively. It is the earnest hope that as an educational influence the deliberations and conclusions of the Society of Railway Financial Officers may be instrumental in establishing those ideals in the ethics of railway financing that make for progress and must be the accompaniment of energetic railway development in other directions."

The following officers were elected: President, George H. Crosby (Rock Island); vice-president, S. L. Shannon (Intercolonial); second vice-president, C. W. Rhodes (Baltimore & Ohio); secretary and treasurer, Carl Nyquist (Rock Island); members executive committee, to serve for two years, George H. Crosby and Frank Scott (Grand Trunk); F. H. Hamilton (St. Louis & San Francisco) and H. F. Baker (Lehigh & New England).

FOREIGN RAILWAY NOTES.

The news of the granting of a concession for the construction of a railway from Taubate, in South America, to Natividade has been very well received in the former city. The prefect gave the camara's employees a holiday and the people rejoiced exceedingly.

The lines under negotiation with the government of Rio Grande do Sul on account of an Anglo-American syndicate represented by General O'Brien, ex-minister of the United States at Buenos Aires, are as follows: From the southern extremity of Lagoa Mirim passing through Sao Fructuoso, Sarandy, and Nico Perez to Sao Luiz; and another that, starting from St. Rosa, a Brazilian town on the Uruguay, will connect by steam ferry with Monte Caceres, an Argentine town on the other side of river in the Province of Entre Rios Railway at Posadas, where an extension is to be constructed from Incarnacion on the Paraguayan frontier.

THE LOGGING RAILWAYS OF THE PACIFIC NORTHWEST.

On the Pacific coast, in the United States and in British Columbia, from San Francisco nearly up to the Arctic Circle, there is gradually coming into being a network of railways about which the general world of transportation hears but little. These roads are built to bring out of the forests the timber which grows on the western slope, and to deliver the logs to the water, the mills or to connecting trunk lines. At present the logging railways form no connecting system, nor do they appear in the railway statistics of the country. Few of them have yet become common carriers. Nevertheless they are by no means insignificant in aggregate length, and their total purchase of supplies during the year would make a respectable figure. Just now they are indispensable to modern logging and to the production of cheap lumber; in the future they will be of inestimable value in building up the country and as feeders to the trunk lines. The economic value of the logging railways is constantly increasing; they are one of the few permanent assets which the country will gain from the devastation of its forests.

An average saw log cut from the forests of the Pacific coast is about 30 feet long and 3½ feet in diameter. It weighs approximately six tons. It is necessary, however, to handle logs up to 8 ft. in diameter and 30 ft. long, weighing 35 tons each. The hand logger of the early 70's could not manage such enormous weights and therefore he cut only choice trees on slopes where the logs would roll into the water by gravity. The ox team and skids of the 80's enabled somewhat less accessible timber to be reached and increased the output per man enormously. But the demand for cheaper transportation became more and more insistent as the lumber industry grew and the areas of choice timber receded further and further into the hills and less easily reached localities. So the ox team was succeeded in turn by the horse, the donkey engine, the tram road and the standard gage logging railway. To-day nearly half of the four billion feet of lumber cut on the Pacific coast is hauled out of the forest over logging railways. As the lumber industry grows older the importance of these roads increases. It will not be long before all the logs cut will be brought out by rail. When this time is reached the logging railways will have attained their maximum importance in the lumber business, but will be only in their infancy as regards their larger and permanent service to the community.

The logging railways began to make their appearance in the 90's. Up to date about 2,000 miles have been constructed and new lines are being built at the rate of about 100 miles per year. These figures are approximations, but are based on state reports and are reasonably accurate. The annual purchases for new line and new equipment amount to, roughly, $1,000,000; and for repairs and replacements, $1,500,000, making a total annual purchasing power of $2,500,000. The roads are owned by various individual mill companies and lumbering industries. They are usually built up valleys and connect the timber tracts with navigable water, with trunk railways or with saw mills. The average length of each is about four miles, but this length is constantly increasing as the timber becomes more and more remotely situated.

In the year 1909 there were 630.75 miles of logging railways in the state of Washington alone; the ownership was divided among 154 lumber companies, making an average of 4.09 miles of track for each company. The Polson Logging Company, operating in Chehalis county, near Gray's Harbor, is credited with 32 miles, the most owned by any single company. There are three other companies in this state which own 20 miles or more of track each. The average length of track owned by each company is increasing both because of the construction of new line and because of consolidations of the various companies. Many roads appearing in the state reports as separately owned are in reality controlled by the same interests. The foregoing figures do not include the several short lines which do a general railway business, but which depend on hauling logs for 90 per cent. of their revenue, nor do they include those branches of the

trans-continental systems which are little more than logging roads.

Some few lines are as much as 50 miles long and several have already outgrown their early stages and become common carriers. Prominent among these is the Bellingham Bay & British Columbia, which, although virtually a logging road, is also a common carrier. This line, which with its branches is 69 miles long, extends from Bellingham, Wash., eastwardly into the Cascade mountains.

A great deal of the new construction consists of extensions of existing systems, although large numbers of totally new lines are built each year. Many saw mill towns have logging railways radiating in all directions up the valleys and into the hills for distances of from 2 to 30 miles. Fortunately for their future usefulness, the logging railways are now all built standard gage.

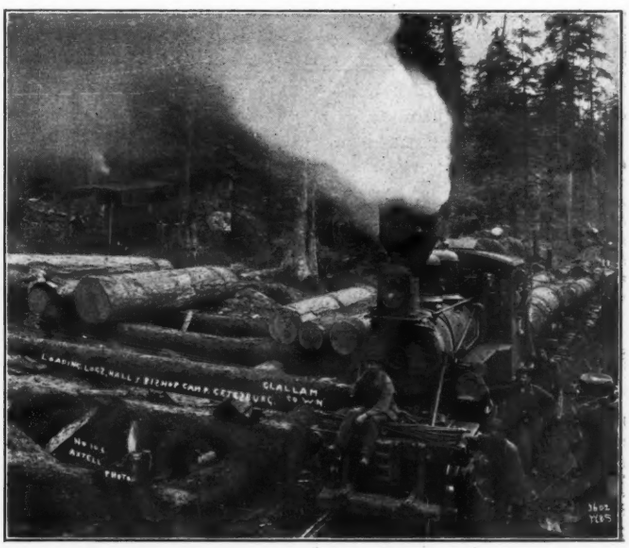
The modern practice in laying out logging roads is to build a main line through the tract of timber to be logged, locating it with reference to the topography of the country and the distribution of the timber. From this main line branches or spurs are extended on either side reaching all parts of the timber. Since it is not economical to yard or haul logs singly through the brush more than 800 ft., the branches are usually built 1,000 ft. apart.

There has been a gradual but perceptible improvement in the location and character of the main lines. The older roads were very rough and crooked; grading was curtailed to the absolute minimum and many tracks were unballasted. Twenty-five-degree curves and 15 per cent. grades were not unusual. At present on standard logging roads the grades on the main line vary from 0.5 per cent. up to 8 per cent. for short distances; 4 per cent. grades, however, are the general limit. One well-known line in Washington has four miles of continuous 4 per cent. grade. Curves up to 12 degrees are permitted on the main lines. On feeders the grades run as high as 15 per cent. for short distances and 20-deg. curves are comparatively common. The main line is ballasted with gravel according to standard practice.

All weights of rail between 36 and 65 lbs. are used; 56-lb. rail, however, may be considered the standard for main lines, and

Lower Terminus of a Logging Railway.

Terminus of a Spur.



Typical Logging Train.

very little new rail lighter than this is being laid. On branches and feeders 45-lb. steel may be considered the standard. The rails are connected with either fish plates or angle bars, modern practice tending more and more toward angle bars and heavier fastenings. Four bolts to the joint, however, are considered sufficient.

Ties are spaced 24 in. on centers. There are four spikes to the tie, sometimes six on curves, and on the better class of roads the curves are provided with rail braces.

The main line right-of-way is cleared only wide enough to admit the track and grade. No more grubbing is done than is necessary. Timber trestles, most of the members being hewed from the adjacent woods, are used almost exclusively where bridges are necessary. Occasionally one will find a timber truss, but these are comparatively rare.

The following figures give the actual cost of a mile of representative main line logging railway in Washington or British Columbia:

	Per mile.
Clearing, grubbing and grading	$2,400
2,500 ties, 25c. each	625
88 gross tons, 56-lb. rails	4,000
Laying track	530
Engineering	100
Total, per mile.	$7,655

The rolling stock is especially built for the service. On account of the sharp curves and heavy grades, light-geared locomotives are in common use, although many roads use ordinary locomotives with four or six driving wheels. The locomotives are all equipped with efficient spark arrestors. Wood is generally used for fuel, but the use of coal is growing. It is found that in many cases the cost of splitting and preparing the wood, plus its value as lumber, is more than equal to the cost of the necessary coal.

In some cases the locomotive drags the logs on skids laid between the tracks, but the general practice is to carry the logs on specially designed trucks. These trucks are built to M. C. B. standards. They are made of steel and are very similar to modern steel freight car trucks except that each truck is provided with a drawbar and two couplers. Across the middle of the truck is built a heavy girder, called a bunk, on which the logs rest. The bunk is provided with adjustable chocks which prevent the logs from rolling. Where the logs are large two trucks are used for each log, one under each end, but generally three logs are loaded on each pair of trucks. The logs are secured to the trucks by chains.

In some cases, particularly where the logs have to go some distance, they are loaded on standard flat cars instead of simply on trucks. In these cases the flat cars are, of course, provided with air brakes, but the ordinary logging trucks are provided with hand brakes only.

There is usually only one locomotive on a given logging railway, so the problems of train despatching are simple. When two locomotives are used, the second engine is confined almost entirely to the branch lines.

The logs are handled in trains, there usually being from six to twelve pairs of trucks per train. A train will weigh therefore from 200 to 600 tons, or even more, depending on the size of the timber. It will be remembered, however, that the heavy load goes down hill; only the empty trucks have to be hauled against the ruling grade.

In addition to the equipment of locomotives and log trucks the railway is provided with a rude passenger car for carrying the men between their work and the camp, and also with a horse car for transporting the horses.

The cost of equipping a road operating one yarder, or one standard crew of men in the woods, is as follows:

One locomotive	$20,000
12 pairs of trucks, at $600 a pair	7,200
Chains, passenger car and horse car	2,000
Total	$29,200

The total cost of ten miles of road and equipment is, therefore, about $110,000. The equipment is practically the same for all roads up to 10 miles in length.

SAFETY APPLIANCE STANDARDS.

Under date of October 13, 1910, the Interstate Commerce Commission issued its order for the application of the safety appliances that have been adopted in accordance with the act of Congress approved April 14, 1910, in which the number, dimensions, location and manner of application are given.

The order follows very closely the standards first suggested by the commission, which were published in some detail in these columns in our issue of August 26, 1910. The details published at that time covered only those pertaining to house or box cars, as the general features of those affecting other cars were practically the same.

The changes made are additions rather than eliminations and are as follows:

In giving the details of brakeshaft construction there is added:

"Lower end of brakeshaft shall be provided with a trunnion of not less than three-fourths (¾), preferably one (1), inch in diameter extending through the brakeshaft step and held in operating position by a suitable cotter or ring.

"The brake-pawl shall be pivoted upon a bolt or rivet not less than five-eighths (⅝) of an inch in diameter, or upon a trunnion secured by not less than one-half (½) inch bolt or rivet, and there shall be a rigid metal connection between brakeshaft and pivot of pawl."

Under each type of car considered a paragraph devoted to the end clearance, and specified as "End Ladder Clearance," has been introduced, as follows:

"No part of car above end sills within thirty (30) inches from side of car, *except* buffer block, brakeshaft, brake-wheel, brake-step, running board or uncoupling lever, shall extend to within twelve (12) inches of a vertical plane parallel with end of car and passing through inside face of knuckle when closed with coupler-horn against the buffer block or end-sill, and no other part of end of car or fixtures on the same above end-sills, other than exceptions herein noted, shall extend beyond the outer face of the buffer block."

As originally drawn up the standards did not make the exceptions now given, which were introduced after a protest on the part of the railways.

In the case of the vertical end handholds the minimum length has been reduced from 24 in. to 18 in.

The reports of the German Shantung Railway are interesting as showing what results can be attained from railways in China. This line has now been in operation for a few years in a very thickly peopled and productive country, but without connection as yet with other lines further in the interior. It is 271 miles long, and in 1909 its gross earnings were $6,293 per mile, against $4,826 in 1908. These seem very moderate returns, but what makes the investors' mouths water is the working expenses, which were but 35 per cent. of the gross earnings in 1909, leaving net no less than $4,090 per mile. And this result is not due to high rates, for the average receipt was but 0.61 cent per passenger-mile and 0.82 cent per ton-mile. Evidently wages are not high. The traffic is not very great, last year averaging 160 passengers and 521 tons of freight each way daily for the entire mileage. Of the total tonnage a little more than half was coal, and next to it comes beans, 8 per cent. Grain was less than 1 per cent.—only about a third as much as petroleum, indicating very little export or import. The passenger traffic is very cheaply carried. More than 96 per cent. of it is third-class, and the number of first-class passengers averages less than five per day. Purely passenger trains are less than one daily, but the mixed trains are more than twice as numerous. The average train-load is 130 tons of freight plus 40 passengers, earning gross $1.33 and net 87 cents. The net earnings of this railway were 45 per cent. greater in 1909 than in 1908, in spite of the great decrease in passenger traffic, the earnings from which were 17 per cent. of the total. All this confirms the conviction that there is a great future for railways in China.

Shop Section.

THE car repair kink competition, a complete announcement of which was made last month, will close on November 15. If you have not yet found time to prepare your contribution to it, do not allow the shortness of the time remaining to discourage you from doing so. Possibly the difficulty in arranging for drawings, sketches or photographs has interfered with your desire to participate. While photographs and good drawings are, of course, appreciated, yet a rough sketch is often just as satisfactory, and in many cases a good description of a simple but labor or time-saving method or practice will prove just as intelligible and as valuable to our readers as the description of a more complicated device accompanied by illustrations, but which may not have nearly as broad an application. Two kinks are required to enter the competition, but more may be submitted, allowing the judges to base their decision on what they consider to be the best two kinks in each collection. Prizes of $35 and $20 will be awarded for the best two collections. Others which are accepted for publication will be paid for at our regular space rates.

INCREASING Shop Output is the subject of the competition which is to close December 15. This is a topic which should appeal strongly to every one of our Shop Number readers, for the extent to which you have succeeded in improving the efficiency and output of your department or shop is a measure of the value of your services to your employer. The subject has purposely been made as broad as possible in order that every department may be represented. Tell us how you solved the problem, for it may prove of great assistance to someone trying to solve a similar problem in another shop; you may gain in an equal measure by finding how he has successfully solved a problem that is causing you difficulty and is hampering your output. A change in the organization, a rearrangement of equipment, the adoption of new methods or machinery, a critical study of the men with whom you work or who report to you, a new or better system of records, more explicit instructions to your employees, a more logical wage system, better treatment of employees, the establishing of a standard cost or allowance for each item of expenditure—all these, and many more, have been responsible for increased output, and there is not one of our readers who cannot tell an interesting story of his experiences along these lines. How did you manage to clean your coaches so much better or handle more coaches per day with the same number of men? With fewer men you are painting more cars in a week than you did last year. Why? The blacksmith shop never could quite keep up with the work. Now you are easily doing so, although you have more work to do and have not increased your force. How did you bring it about? The car repair yard is making a wonderful record this year. Why? Five more locomotives per month off the same number of pits. Who is responsible? How was it done? We made some changes in the flue shop and increased its output 25 per cent. What were they? When we completed certain changes the boiler shop was easily able to hold its own with the other departments, although it had not previously been able to do so. What were they? These are only a few suggestions to show the wide range of subjects which may properly be considered in connection with the increasing of shop output. The article should contain from five hundred to fifteen hundred words. Prizes of $35 and $20 will be given for the two best ones. Others which are used for publication will be paid for at our regular space rates.

A GENERAL Shop Kink competition will be held, to close January 15. It will include any kink used in connection with the repair and maintenance of locomotive or car equipment. The prizes will be $50 and $25 for the best two collections of three kinks. More may be submitted, but the award will be based on what the judges consider to be the best three kinks in each collection. Kinks or articles which do not win a prize, but are accepted for publication, will be paid for at our regular rates. Contributions may be entered any time between this and the closing date.

TWENTY articles were submitted in the competition on The Care and Selection of Machine Tools and Shop Equipment, which closed October 15. The grade of these contributions throughout was so high and a number of them were so good that the judges have had great difficulty in awarding the prizes. The first one of $35 goes to J. S. Sheafe, engineer of tests of the Illinois Central, Chicago, Ill., and the second prize of $20 to E. T. Spidy, instruction card inspector, Canadian Pacific, Angus shops, Montreal, Canada. The other contestants, not arranged in the order of merit, were: H. G. Becker, shop demonstrator, Lehigh Valley, Sayre, Pa.; George Black, machine shop demonstrator, Canadian Pacific, Angus shops, Montreal, Can.; C. J. Drury, master mechanic, Atchison, Topeka & Santa Fe, Arkansas City, Kan.; W. J. Eddy, tool room inspector, Erie, Meadville, Pa.; John M. Hamm, machine foreman, Lehigh Valley, Sayre, Pa.; A. H. Kean, general foreman, Chicago, Burlington & Quincy, Havelock, Neb.; John V. Le Compte, foreman, Baltimore & Ohio, Garrett, Ind.; C. C. Leech, foreman, Pennsylvania Railroad, Buffalo, N. Y.; Charles Maier, engine house foreman, West Jersey & Seashore, Atlantic City, N. J.; J. F. Perritt, blacksmith foreman, Seaboard Air Line, Jacksonville, Fla.; A. D. Porter, shop efficiency inspector, Canadian Pacific, West Toronto, Ont., Can.; W. W. Reeves, machinist, Illinois Central, Burnside shops, Chicago, Ill.; William G. Reyer, general foreman, Nashville, Chattanooga & St. Louis, Nashville, Tenn.; George H. Roberts, assistant machine foreman, New York, New Haven & Hartford, Readville, Mass.; W. H. Snyder, assistant general foreman, New York, Susquehanna & Western, Stroudsburg, Pa.; W. P. Spade, formerly a shop specialist on the Baltimore & Ohio, but now with the Corning Glass Works, Corning, N. Y.; M. H. Westbrook, Battle Creek, Mich. The twentieth paper was prepared by the "Old Railroader," who for good reasons does not care to have his name used. It will be recalled that he presented a splendid paper in the competition on Increasing Shop Efficiency.

A GLANCE at the names of the contestants in the competition on The Care and Selection of Machine Tools and Shop Equipment, as announced above, shows at least fourteen different titles represented. It is not surprising therefore that the twenty papers differ greatly from each other, both as to the information presented and the manner of presenting it. Each one of the seven papers published in this issue is different from the other six, both as to the phase of the subject considered and the viewpoint. For instance, Mr. Sheafe's paper is mainly devoted to the care and maintenance of machine tools and the small tools used in connection with them. Mr. Maier, an engine house foreman, gives more attention to the general question of the selection of tools, but soon swings over and gets into the problem from the engine house point of view; his closing notes on the relation of the men and the tools they operate are important. Mr. Porter's paper goes into the belting question thoroughly; it is interesting to note that most of the contestants had something to say on this subject. Mr. Eddy, the tool room inspector on the Erie, treats the subject from the standpoint of one having general charge of the care and maintenance of tools on a large system. Mr. Reeves' notes from the viewpoint of a machinist are most interesting. His article is based on twenty-two years of experience on fifteen railways—and on two other vocations, that of the "circus" and the "sea," fields which railway shop mechanics do not often invade. Following is a quotation from one of his letters to the editor: "How far would a

storm-bound steamer get on Lake Superior if the most necessary tools had been left in Duluth and it became very acutely urgent to adjust some of the machinery to keep the boat from sinking? Hence that motto, 'a place for everything and everything in its place, and lash it down, if necessary.' Again, what is the canvas boss with a circus going to do if the center and quarter poles, a portion of the canvas, and the elephant car are left in the last town? The same thing applies to a machine shop and the pending job. Where, oh, where, is that ugly looking oil can? Where is that certain piece of iron, or the things we used to have to do this or that with? The absence of these things, is, of course, not as dangerous as at sea, but to my mind it is just as costly as in the case of the circus." Mr. Perritt takes us into the smith shop. Not a great many years ago one would have looked in vain for machinery in that quarter, but the railway smith shop would be practically helpless without it to-day. Mr. Drury's paper considers a subject not touched on by any of the others—the standardization of small tools and their manufacture and distribution from a central point. All of these papers are good and there are thirteen others still to be published. Mr. Spidy's article, which was awarded the second prize, will appear with others in the December number.

AS a result of the rule requiring that steel cars only shall pass through the tunnels and enter the New York station of the Pennsylvania Railroad, quite a number of orders have been given for the construction of all-steel business cars for railway officers and wealthy men who are accustomed to travel in their own private cars. The wooden business car, luxurious as it is and handsome in its finish and trimmings, must be replaced for this purpose by a structure made entirely of steel. The comforts of the wooden car, provided by its almost perfect insulation, included protection from heat and cold as well as noise. The beauty of the inside finish, made of mahogany or rare veneer, with artistic lines and shapes, delighted the eye. It will be a difficult matter to obtain equivalent effects when the base is an ugly grey steel sheet or molding. While remarkable progress has been made in adapting this material to passenger car construction, and the structural problems have been solved, much remains to be done in the direction of better insulation and a more pleasing interior decoration. Some of the all-steel parlor cars are unusually noisy, and there is noticed a peculiar rumble in the train that is not found with wooden cars. The color of the inside finish is usually too dark, and the dull paint is easily soiled and is difficult to maintain in its original tone. The toilet and smoking rooms are severely plain and are only relieved in outline by round-headed rivets. They give one the feeling that he is occupying a cell in a calaboose. Something different will be demanded for the new steel private cars, and we may be indebted to the methods that will be worked out for them, for improvements which shall make the future steel parlor cars and sleepers for the ordinary traveler more comfortable and more beautiful.

CONVENIENT methods for removing trucks from heavy passenger cars are as important a part of car shop equipment as those for locomotive wheels in the engine house, but this necessity is not always recognized. The usual method is to raise the car body by hand screw or hydraulic jacks; this is slow and laborious, requiring the constant transfer of the heavy jacks. At a new coach shop in the west there is a steel structure outside the shop with fixed power hoists capable of raising the heaviest car body. The trucks are removed and taken by transfer table to the truck shop; the car body is let down on temporary trucks and transferred to the repair shop. This method is a vast improvement over hand jacks, but it is open to the same objection as made to the use of shear legs at English engine houses for removing locomotive wheels. The heavy car is raised by an expensive overhead structure, when the lighter portions—the wheels or truck—could be dropped by the use of a much less expensive pneumatic or hydraulic jack in a pit. A drop pit for coach shops would, therefore, appear to be the most convenient and economical method for removing trucks, and it would not be expensive for application to old shops. New car shops are usually equipped with overhead traveling cranes, especially those intended for the repair of steel freight cars, and overhead cranes are provided at the truck shops. Traveling cranes for lifting modern steel passenger cars which weigh as much as 70 tons—and the bodies alone 50 tons—would require expensive columns and crane girders, and the cranes themselves would cost too much to warrant their use in a car repair shop. The drop pit—operated by compressed air, electric motor or hydraulic power jacks—is the most economical method of removing passenger trucks, and there are numerous shops where they could be profitably installed.

WE have been requested to inaugurate a Question and Answer Column for the benefit of our readers, the idea being to publish each month any questions that may be sent in relation to railway shop practice; the answers receeived from other readers, who may be able to supply them, to be published in the following issue. We shall be glad to comply with this request if our readers will start the ball rolling by sending in the questions, and co-operate with us in securing the proper answers. In this connection we should like to hear from some of our readers as to the proper length of wrenches for locomotive and car shop work. This is suggested in the letter from Mr. Snyder, published on another page.

THE CAR DEPARTMENT AND THE STEEL CAR.

THE introduction of the steel car in both passenger and freight service is rapidly transforming the equipment of most railways and gradually changing the character of the car shops and making its impress upon the car department generally. The shops are becoming iron working shops with punches, shears and riveters, and the repair men are no longer carpenters and cabinet makers, but sheet metal workers and blacksmiths. The design of the steel car is more of an engineering problem, and most of the work can be handled better by the machinist or other iron worker than by the old time car builder or wood worker. It is a remarkable fact, however, that the cabinet maker in the shops of the large passenger car builders has so adapted himself to the fitting of steel sheets, moldings and trimmings that his work is more rapid and accurate than the regular sheet metal workers. The work on the inside finish of steel passenger cars is now so systematized, and the men have become so skilful, that it is done more rapidly and the cars are turned out in a shorter time than was ordinarily required for those with wooden finish. It is true the surfaces and outlines in the steel cars are of necessity simpler and plainer than they were in the wooden car, but it remains to be seen whether they will be more durable and will cost less for maintenance and repairs. The car shop in its larger and in some cases almost exclusive use of metal instead of wood is coming in closer association with the locomotive shop, and the general supervision of both departments by one officer is even a more natural and reasonable condition than it was when wooden cars were used exclusively.

The vast change that has come over the car department in recent years on account of the introduction of the steel car is scarcely realized. Its importance may be gaged when it is found that on account of the large number of cars as compared with the locomotives on most lines, the cost of maintenance of cars is now greater than that for locomotives. The wholesale retirement of old wooden cars which became necessary with the purchase of new steel equipment has resulted in an unusually large item in the depreciation account for both passenger and freight cars. In the recent annual report of one of the large western railways we find that the depreciation of freight cars is charged at over one million dollars and for passenger cars over $750,000. In the east the steel car has been used more extensively and in the report of one of the larger eastern lines over three million dollars is charged against depreciation of freight cars in one

year and a slightly larger amount for depreciation of passenger cars. On the same line the cost of maintenance of freight cars alone, including depreciation, was 50 per cent. greater than the cost of maintaining locomotives; and the expense of maintaining freight and passenger cars, including depreciation, was very nearly twice that for locomotives.

While the large item of depreciation applies only to some of the systems that have introduced steel equipment rapidly and have condemned large numbers of old wooden cars, yet it is a condition that all lines are approaching and it may safely be said that for some time to come the expense to railways of maintaining cars will equal or exceed the cost of maintaining locomotives. Where an equal amount of money is involved in the expenditure for labor and material in maintaining equipment, it would seem that the opportunity for waste and extravagance on one hand, or for economy and careful supervision on the other, would be greatest where there is the largest subdivision, and therefore, the car department, except in the matter of fuel economy, offers a more favorable field for good management in reducing expenses and in keeping them down than the locomotive department.

The freight car truck is by far the most numerous structure on railways, a dozen roads owning over 50,000 cars. They each have 100,000 freight trucks to maintain and the same multiplicity extends to other parts of the car—four times as many axles and eight times as many wheels—which in the aggregate make up very large numbers, so that the very small saving on each one will make a large item in the showing for the whole equipment. When such large expenditures are involved there must be large appropriations for shops, tools and salaries for supervision, and the car department becomes a more interesting field with greater promise of advancement than it has had heretofore. It should therefore attract more of the higher grade men who have been heretofore trained entirely in the locomotive department, and the organization in the mechanical department of railways should be such that the future motive power officer shall have a practical experience in the car department.

ENGLISH ENGINE HOUSE PRACTICE.

LIBERAL abstracts of the four papers discussing American engine house practice, which were presented at the joint meeting of the American Society of Mechanical Engineers and the English Institution of Mechanical Engineers, have been published in these columns. The only paper on English running-shed practice was presented by Cecil W. Paget, general superintendent of the Midland Railway, Derby; and it will be interesting to take up some of the features of English practice as described in this paper, and as brought out in the discussion, and point out how they contrast with American methods. It is the general impression here that the prevailing type of engine house in England is rectangular, but the author in describing English practice states that the center turntable type possesses considerable advantages of working, on account of the ease with which the engines can be got in and out without moving others. The illustrations in the paper include an engine house on the Great Western Railway, which, although rectangular in shape and 360 ft. by 400 ft., contains four turntables and has a capacity for 100 locomotives. The rectangular house as used abroad is economical in first cost and maintenance, but it is open to the objection of making it difficult to handle one particular engine without moving others. One of the most recent engine houses built in England is that at Eastleigh for the London & South-Western. This house has 15 through tracks and is 350 ft. long; the approaching tracks on each side are more than 400 ft. long. There is a quarter pitched roof over each set of three pits and a skylight on each side, so the lighting in daytime is admirable. Longitudinal hoods extending the whole length of the house and wooden flues extending through the roof provide for the escape of gas and steam.

Along one side of the house is what is known as the lifting shed, where shear legs are placed, which are capable of lifting one end of an engine so that the wheels and axle boxes may be removed for examination or repairs. These shear legs were at one time almost universally made of wood and of the tripod type, but on account of the greater width and weight of engines they are now made of steel with four columns. In the discussion of the paper it was pointed out that this method of raising locomotives was not only inconvenient but expensive, and that a more rational method was that of dropping the truck wheels or driving wheels, which weigh only a few tons, instead of lifting the enormous weight of one-half the engine. It requires three times as long to take out a pair of tender wheels with a shear leg as with the wheel drop jack, and with driving wheels the difference is even greater. The illustrations of wheel drops that have been built for English engine houses would indicate that they are more elaborate and expensive than those in general use in this country. One recent American engine house has, in addition to a large drop table over 50 ft. long, operated by electric motors, three drop pits, each operated by three pneumatic jacks.

The floor of engine house pits is usually made convex to drain down to each side, but it was suggested that a better shape would be to give the floor a straight incline to one side with a covered drain at the lower side. The height of the pit should be such that the distance from the bottom to the center of the link motion is about the height of an average man up to his eyes.

The use of hot water plants for washing out boilers and water softening plants for improving the quality of the boiler water, while not generally used in England, is being gradually introduced and is regarded with as much favor as in this country. On English railways the general practice in cleaning engines is to employ boys from 14 to 19 years of age, who are afterward promoted to firemen. This is regarded as a kind of an apprentice system. It is doubtful if such a system could be introduced in this country, as it is even hard to get young men to enter an apprenticeship in the cleaner work of the machine shop.

It is generally admitted that more attention is given to the cleaning of locomotives in England than in America, and it is believed that the money is well spent, as a clean engine enables defects to be more readily detected. It is also a good advertisement, as the appearance of locomotives is noticed by passengers at stations. The clean locomotive also has a good moral effect on men, and consequently affects the amount of repairs to the engines.

On the Lancashire & Yorkshire road the amount of material kept in stock was valued at $40 per engine under steam. While figures for other roads were not available, this is believed to be much less than the stock kept at American engine houses.

In regard to engine failures, the records of the Lancashire & Yorkshire show only two per day for 1,000 locomotives, the chief cause of failure being leaky tubes or other tube troubles. On the Midland Railway, with 3,000 locomotives, the number of failures is less than one per day for each 1,000 locomotives under steam, and the tube troubles on this road are not so numerous. In the London district it is extremely important that no engine failures occur, for while the cost of repairs might be comparatively small, the disorganization of the service on such a section of the line, with frequent train movements, would prove very expensive. In this particular America has something to learn from English methods in regard to the prevention of engine failures about large terminals.

It is generally admitted that the mileage of English engines falls far short of that obtained in America. In England 10 per cent. of the engines are in the shop under repairs, and others—making a total of 25 per cent. out of service—are being washed out or detained at the engine house, so that 75 per cent. of the equipment is available for use.

The compilation of mileage, wages, coal, oil, stores, etc., involves such an amount of routine work that the Lancashire & Yorkshire has adopted the Hollereth tabulating machine with cards and punched holes. These cards, when conveniently assembled, show the cost of operation at various engine houses

and for different classes of engines. Mr. Paget's paper also contains a complete description of the method of inspecting locomotives on the Midland Railway, based on time and mileage.

MECHANICAL ARTICLES DURING OCTOBER.

SHOP NUMBER readers may want to refer to articles of interest to the mechanical department that have appeared in the weekly issues of the *Railway Age Gazette* since October 7. They are as follows:

The Safety Appliance Order. Editorials commenting on the final conferences of railway representatives and others with the Interstate Commerce Commission.—Oct. 14, page 682, and Oct. 21, page 728.

Steam Auxiliaries for Passenger Service. So much power is required for operating air brakes, electric lights and steam heat on passenger trains that more attention should be given to the possible economies that may be effected in their use.—Oct. 21, page 726.

Ideal and Actual Paint Practice. Too little attention is given to the proper method of preparing metal surfaces before painting.—Oct. 28, page 772.

Wire Glass. The use of wire glass in shops, engine houses and other buildings was briefly discussed at the Bridge and Building convention.—Oct. 28, page 791.

Fireproof Oil Houses. A committee report presented before the Bridge and Building convention.—Oct. 28, page 793.

Pacific Type Locomotive for the Central Railroad of Brazil. Illustrated description.—Oct. 28, page 795.

Letters to the Editor.

CAR WHEEL FOUNDRY PRACTICE ON THE CANADIAN PACIFIC.

Montreal, Can., Oct. 22, 1910.

To the Editor of the Railway Age Gazette:

We have read with a great deal of interest George L. Fowler's interesting and very able article on Car Wheel Foundry Practice on the Canadian Pacific that appeared in the *Railway Age Gazette* of October 7. As we are the general sales agents for the Deseronto charcoal iron referred to, we were, of course, pleased to note the mention made regarding our iron, but regretted to note that there was a serious error made in giving its analysis, which error we are afraid was caused through a misapprehension owing to information given by our Toronto office, the analysis of our iron as given being more injurious than otherwise to our business.

Knowing the reputation and policy of your paper, we feel sure that you would not intentionally do us an injustice in this respect and that you will be willing to correct the error made.

The two important errors were in reference to the phosphorus and sulphur content. Your article quotes the sulphur content as being from .01 to .03. The maximum sulphur in our iron is .018, the sulphur running from only a trace to this maximum, with an average considerably below the maximum. In regard to phosphorus: Your article quotes the phosphorus as running from .165 to .34 per cent. The maximum phosphorus is .20 per cent. and the majority of it runs from .14 to .16 per cent.

We enclose a copy of our grading card which gives the other contents of the iron for the different grades which we supply, ranging from A Scotch to No. 6 White Iron. The manganese is furnished as required by the specifications of our different customers and ranges from .30 to .90 per cent. The silicon content, of course, varies according to the grade required.

R. J. MERCUR & CO.

LENGTH OF WRENCHES.

Stroudsburg, Pa., Oct. 10, 1910.

To the Editor of the Railway Age Gazette:

I would like to get an expression from your readers as to the proper length of the following size wrenches: ¾, ⅞, 1, 1¼, 1⅜ and 1½ in. These are the sizes that are mostly used on car work and in a locomotive repair shop. The question has often been asked as to what the proper length should be. Bolts in locomotive and car work must be drawn up tight and you will agree that the supposed standard wrenches that are sent out with new machinery, stationary engines, etc., are too short for general work.

W. H. SNYDER,
Assistant General Foreman, N. Y., Susq. & Western.

APPRENTICE NOTES.

The following notes are taken from the proceedings of a conference of the apprentice school instructors of the Atchison, Topeka & Santa Fe, held in Topeka, Kan., almost a year ago and at the close of the second year of the new apprenticeship system.

The Dull Boy.—In his opening address, F. W. Thomas, supervisor of apprentices, laid considerable stress on the necessity of giving special attention to the slow, or the dull boy. He said: "For the bright, active, industrious boy, each of you has admiration. He offers no serious problem for you to solve. He will take care of himself. It only remains for us to act as governors, to apply the brakes occasionally to his progress. It is for the slower, duller boy, the plodding boy, I wish to speak. This boy watches the advancement of the brighter and smarter fellows with a feeling of envy. He broods over his slowness; he thinks he hasn't an even chance; he watches with selfishness the rapid progress of the others and soon begins to think he is a misfit; he loses interest in his work and drops out of service instead of swimming against the current with his power. The world has use for this boy. There is a function in the economic realms of nature that he must perform. It is in the handling of these boys that the real power, ability and value of our instructors are manifested. Here it is that tact and patience must be freely exercised. You must talk without scolding; reason without browbeating; smile, and not frown. It requires a greater artist and a greater genius to cut and shape a living statue from a rough block of marble than it does to simply chisel the name or date on the finished piece of sculpture and then place it on its pedestal. These are the boys whose molding, scouring and polishing will reflect the success of the instructor. Be patient with the dull boy, be indulgent, be companionable, be helpful. Above all, be extremely slow and sure of your ground before you send him in for dismissal. We are building up, not pulling down; we are trying to create rather than destroy. We are building, shaping, molding a precious cast, a human life, an immortal soul. Put your trade-mark on the cast."

Selection of Apprentices.—At present the apprentice instructors at all points examine each applicant and make a report to the chief mechanical official. It was decided that before making his recommendation he should ascertain if the applicant is physically fitted for the trade, should examine him as to his schooling, should ascertain as much as possible about his home life and associates, and above everything else endeavor to ascertain if he possesses any talent or natural fitness for the trade for which he is making application, and if he is specially desirous of learning this particular trade, aiming at all times to place the standard just as high as it can possibly be placed for that particular trade at that particular point; if necessary, a week's time should be taken for this examination and investigation.

Co-operation of Shop and School Instructors.—It is absolutely necessary for the shop and school instructors to co-operate not only in letter but also in spirit; that between the two there should exist a brotherly feeling, a feeling of warm friendship and of dependence. Each should feel perfectly free to go to the other for assistance or help and they should meet together as often as their duties and business permit. The supervisor of apprentices stated that he considered both positions of equal importance, that they were equally responsible for the training and welfare of the boys, and that credit or discredit would alike fall upon both for the success or failure of any apprentice.

Practical Value of the Classroom Work.—The discussion of this question brought out the fact that the lessons learned in school made the boys more accurate in their shop work, that the boys who were quick, active and accurate in their school work had proved to be the best boys in the shop, this being evidenced in a more pronounced manner where they had to work from blue prints, and especially in the boiler shop in laying out work. Shop instructors report that the boys are using their heads more than formerly and that third and fourth year ap-

prentices have no difficulty whatever in reading or interpreting blue prints and drawings.

In a paper on this question, C. W. Smith, apprentice school and shop instructor at Richmond, Cal., said: "A case of a piece of work came up a few days ago that required the drilling of a number of holes. I had a sketch and considered it quite difficult for the apprentice who was to do it, he being in his first year. I gave him the sketch without any instructions, and he had no trouble in going ahead and completing the job. During the eight months that the school has been in operation in Richmond I have seen marked improvement in the shop work of the boys, and in none is it more apparent than with the boilermakers and sheet iron workers. It tells directly in their every-day work and enables them to lay out work that in many instances would puzzle old and experienced men. At the Richmond shop two water tanks were built for the steamer Ocean Wave. These tanks were 54 in. in diameter and 24 ft. long, and had to be absolutely tight. The work was handled entirely by apprentices. All the flange connections and manholes, etc., were laid out from a sketch and an errorless job was made in good time, all of which was accomplished principally from knowledge gained in the school. Three of the boys who did this work were first year apprentices, and the other was in his third year. Apart from specific cases of this kind that might be cited, I am convinced from my own observation and the reports of the foremen who have to deal with the apprentices that the school training sends them to their work anxious to learn, better equipped to do their work well, and in so doing to improve their own position in life and repay the company for its efforts on their behalf."

Keeping the Boys Satisfied.—The boys should be kept constantly engaged in their work, as loafing and idleness give a boy opportunity of brooding over some imaginary grievance. He should be encouraged to approach the instructors for help and advice on any and all subjects. He should be discouraged from spending his evening hours at places where railway men, railway officials and shop matters are discussed as a matter of gossip. He should furthermore be discouraged from speaking lightly of any shop official or any other official of the company. The instructors should at all times be very careful on this subject themselves. Preach Santa Fe to them on all occasions. Give the boy to understand that the Santa Fe apprentice system is the best in the world. This sermon we can truthfully preach.

Discipline in the School Room.—It is absolutely necessary for the apprentices in the school room to know that the instructor must be master and that they should at all times appreciate his authority. This authority must be so exercised as to guarantee a quick and certain obedience. Along with this military discipline enough personal or parental spirit should be manifested in order that the boys' confidence and love may be commanded at all times. It was suggested as an experiment that occasionally a recess of some two or three minutes might be given in the school room in which the boys might relax from their duties. They should not, however, be allowed to leave the school room. While the school course should be adhered to in general and in detail, yet at times sufficient diversion may be made by the instructor in presenting some special subject in which the apprentice has shown an interest. Individual instruction should be given great prominence and each boy's special needs considered and provided for.

Instruction in Spelling, Writing, Etc.—Each of the instructors had noticed the weakness of the boys in spelling and writing and in the ability to express themselves understandingly. It was decided that all the apprentices who are backward in spelling and writing should be made to study and practice these two branches, and that for special training all the requests of the apprentices for favors, supplies, etc., should be made in writing. Occasionally fifteen minutes of the school time could with profit be devoted to spelling matches. All free-hand drawing should be confined to making sketches, the sketches to be reproduced as mechanical drawings.

The Backward Boy.—All the instructors recognized this as one of the most serious and important of the many questions that must be dealt with in handling apprentices, in that the moral, as well as the mental, obligation of the instructor is brought into prominence. It has been shown in a number of cases that some of our best boys have been developed from applicants who in the beginning belonged to the class of backward boys, and it is to these boys that we must look for our steady and constant mechanics. Patience, kindness and a humane interest are absolutely necessary in handling such boys, and these virtues, if not already possessed by the instructors, should be cultivated. This subject again emphasizes the importance of considering the apprentices individually.

Special Work for Apprentices.—The discussion of this subject tended to discourage the idea of detaching the boys from their shop work and giving them outside duties that had the least tendency to make them dissatisfied with their shop life. The fact was emphasized that the object was to make mechanics. In many cases it had been noted that when boys had been detached from shop work and given some office work to do, these lighter duties, easier hours, and the cleanliness of the work often made them somewhat loathe to resume work in the shop. The instructor should be careful in his instruction and should be sufficiently well acquainted with the apprentices to know how far he can go in any special or extra studies without injuring the boy. At the same time it should be the object and desire to teach the boys any special line that may be of benefit to them in the trades they are learning.

HOT WATER BOTTLES FOR HEATING PASSENGER CARS.

Although the limited and express trains on French railways are equipped with every comfort, the local trains are entirely without them. These trains are for the most part made up of the oldest cars, and consequently have many defects, of which the primitive method of heating, by means of hot water bottles, may be considered one of the most annoying. Upon entering

Hot Water Bottles Being Removed from the Car at a Terminal.

the compartment one stumbles over them, and they continue to be in the way throughout the journey. At first they are so hot that one cannot bear to keep his feet on them, but they soon grow cold, and are then worse than useless. Complaints are of no avail; you have to sit with the cold "warmer" under your feet until you get to one of the larger stations. The traveler is then gladdened by the employee's request "Attention s'il vous plait," as he requests you to make room for the fresh heater and removes the cold one.

Care and Selection of Shop Equipment.

FIRST PRIZE.

CAN THE EFFICIENCY OF SHOP TOOLS BE INCREASED?

BY J. S. SHEAFE,
Engineer of Tests, Illinois Central, Chicago, Ill.

Abuse of Machine Tools.—The machine tool leaving the manufacturer's hands is to-day in very good shape to withstand much abuse, as this is the most important problem with which the tool maker is confronted, and he builds accordingly. Yet what a shame it is to see a beautiful machine roughly handled, scarred up and hammered! And is it other than the exceptional case to see a careful operator? If so, make a note on your next visit to a shop of the number of cases where a soft hammer is seen, as proper, instead of the constant use of the hard and ruinous machinist's hammer, as prevalent and improper, when to hammer is necessary.

How can this be eliminated? It cannot be until switchmen stop breaking up rolling stock, until engineers work their engines as advantageously as they would were they paying the coal bills, until trainmen do not waste supplies, and sectionmen do not leave jacks, picks and spikes on the right of way; in fact, until human nature changes for the better.

How Can Abuse Be Stopped?—There is this situation to be met and the only way to meet it is to work for the co-operation of everyone and thus to differentiate the unknown waste from a maximum towards zero, which value will never be attained, as there will always be some men who cannot be reached by anything but a time check; even then you are shifting the responsibility to some one perhaps not as well able to cope with it. The average man is sure to get just a little careless if he gets the impression that he is, in a way, "out of it." Now here lies the opportunity for accomplishing something by co-operation. Will any man admit that he has not gotten under his work with a good bit more vim after some superior officer has talked with him, asked his help, his advice, or made him feel that he was an important part of the organization? A machine cannot move itself, no more can it take care of itself. You look to the men to move it, so also look to them to take care of it, to prolong its life, to give maximum service, and to do good work while it is in the game.

The machine tools are usually run by the men who stay a long time in one place. The small tools, such as reamers, taps, pneumatic tools, etc., are mostly used on the pit side by the men who are here to-day and away to-morrow. The machine tool is operated daily and by the same individual; the small tool perhaps not twice by the same man; therefore the machine tool operator is more apt to look after his own comfort by keeping his particular machine right up to the mark, and if he is not so doing, the only alternative is to move him along down the line, as necessary, until he is a member of the stripping gang. He can then do as much hammering as he likes with less chance of damage.

There is no good reason for a corporation to meet the expense of repairing and renewing tools broken by indifferent workmen. In civil life an individual stands responsible for all damage to property nor his own. The large majority of shops have some system of checking up damaged tools, with the supposed object of holding the operator responsible. This is all right, but how many cases are being followed up, blame fixed and penalty collected? The mechanic is a man of intelligence and is open to reason. This being the case, a vast deal of money is to be saved for the companies by looking more closely into the breakage of tools. The tool room checker may be accused, many times rightfully, of too lax inspection of small tools when returned, thus making it possible for damaged reamers, dies, etc., to get back to the rack in improper condition; the mechanic responsible for this condition, with no knowledge either in the possession of the tool room or the foreman, goes on about his business feeling that the damage was not the result of his carelessness.

Keep a Check On Condition of Tools.—There is not a tool room foreman in the country who does not take a pride in the work turned out. It would be impossible for him not to feel a just satisfaction in tools nicely made, but after he sees these same tools returned all knocked out day after day, he would not be human if he did not ask himself: "what is the use?" He should, however, spend a little more time at the counter, looking over returned tools, while there is an opportunity of getting the right man. A small card, tacked to each case, whereon the tool-room boy could enter the number of the check and the date, would give a record of just who had used the particular tool for several times, and it would be possible to have a complete history of its users in cases of uncertainty. This should be in addition to the check left by the mechanic, which is a positive receipt for the possession of the tool belonging to the checked, empty rack.

Placing Responsibility.—There are two sides to the tool room question in the shop, engine house or repair yard. First, the company should not suffer loss either from broken, damaged or lost tools. Second, a mechanic should not be held wholly responsible for a tool that he is using and which some one has borrowed when his back is turned, or which has broken in fair usage. How to determine between the one and the other is, of course, up to the foreman. His knowledge of the characteristics of the one using the tool could almost decide the case, and correctly, too.

That a strict accounting should be made to prevent loss to the company is certain, but it is equally true that each question should be decided in all fairness. The only successful way to insure the proper care of tools, when used by a large number of men, is co-operation. First get the man, and after he is secured, leave it to him. He will take good care of the tool, get it back to the tool room in good shape and be contented and happy, and being thus will help to line up the others.

Tempering Tools.—Human accuracy is too limited to get a uniform temper on tools by the old fashioned hardening and drawing. Many good tools are too hard, and break, or are too soft and lose edge. On a dark day the heat seems more than on a light day. The electric furnace, with its pyrometer, determines absolutely the point at which the carbon changes and at which the tool should be quenched, and by this means the uncertainties of the tool dresser are overcome. Many good tools are spoiled by an indifferent method of tempering and as it is unfair to give one man an opportunity of improperly finishing up another's work, it follows that the tempering plant should rightfully be an adjunct of the tool room and under the tool room foreman's direct supervision.

Selecting New Tools.—In recommending new tools a foreman can get the best results by visiting other shops and getting their experience on the same work. Experience means dollars and cents, but mostly dollars, and minimizing the expense is something inherent in most people in responsible positions. It must be remembered that hundreds of men, all over the country, are working out similar problems and something that has worried one man has been mastered by another. It seems always best to recommend a standard article, regardless of price. The leading makers ask very little more than the ones who are really expecting the purchaser to help them experiment.

Care of Pneumatic Tools.—Pneumatic tools cost more than they should for repairs. Why? Because they are working a large percentage of water most of the time, are lubricated with the nearest oil at hand, and are not carefully handled. Every

shop should provide means of drying the compressed air. This can be accomplished either by expansion through an orifice or by radiating pipes and storage out of doors, as the warmer shop air will dry any air which is moist in a cooler temperature.

Care of Belting.—Many machines are abused when the operator has lost his temper, perhaps owing to a poor belt, or one which is too short for efficiency. The counters are too near to the lines shafts; this means a tight belt and much loss of power. The long sagging belt will help out many a machine that is balky in taking a good cut, but the shop layout prevents any betterment many times. Some belt dressings, like some boiler compounds, are not made use of by the people who manufacture them. This is an important item and the action on the belts should be carefully watched. Many belts have been short lived on this account, and so a safe rule to follow is to use belt dressing sparingly, if at all. An overdose of dressing defeats the very end it is expected to attain, and may be compared with a physician's prescription; not the fact that certain medicine in any quantity is needed to effect a cure, but that the physician gages the necessary amount, beyond which it is hazardous to venture.

Have Plenty of Emery Wheels.—Emery wheels, in most railway shops, are conspicuous by their absence from convenient locations. A machinist would rather continue for a while the use of a slightly dull tool than to bother going perhaps the length of the shop and waiting his turn at the wheel. This is hard on the machine, already hard pressed since the advent of high speed steel; also on the work and the man. When it is remembered that the rate of deterioration of a tool when dull does not vary as the work done, but as the square of the work done, there is an abuse all around. Emery wheels should be placed in all parts of the shop, both machine side and pit side. This makes it inexcusable for a man to work with anything but perfect tools.

Paint Machine Tools.—Machine tools should be kept painted a good bright color and the operators will keep them presentable, at least 49 out of 50 will. This, like many other seemingly superficial things, is only one of the little points which go to make up an educated shop, and in this kind of a shop there is little, if any, machine tool abuse.

Educate Apprentices Properly.—A great deal of responsibility lies with the foreman in charge of apprentices. He can either inspire them with a desire to outstrip their fellows in output or quality of work, which necessitates the proper care of the tools they use, or he can keep the boys moving from one machine to another, putting in the required time at each, shifting for themselves, learning as much or as little as they like, working hard or loafing harder, and becoming precise and careful only in turning in their checks when the whistle blows.

The careful, methodical man is always respected if not emulated.

THE TOOL QUESTION.

BY CHARLES MAIER,
Engine House Foreman, West Jersey & Seashore, Atlantic City, N. J.

One of your advertisers on the front cover of the October Shop Number makes a statement that applies to the tool question in general: "The keynote of cost is in the equipment." This is so self-evident that it admits of no argument. The only thing that must be taken into consideration in connection with it is: What shall that equipment be for any particular shop?

Selection of Tools.—It is obvious that it would be extravagance to put a large amount of tools in a shop where they would seldom be used. On the other hand, it would be poor economy not to provide tools simply because a certain sum of money that had been appropriated for this purpose had already been expended. This brings up the question: What shall determine the necessity of getting a tool? Suppose a certain operation had to be performed on an average of once a month. If it could be done quicker by a special tool than by hand it would not necessarily be an argument in favor of getting the tool. If the amount saved in the operation would not save the interest on the cost of the tool, together with a liberal percentage for depreciation, and then show a gain besides, it would not be advisable to get the tool unless an increased amount of business was in sight for the shop in question.

On the other hand, some operations are performed by hand, or by tools that are not up to date, that could easily be done in a much shorter time if a modern up to date tool was at hand. If such a tool can show a saving over and above interest on cost and depreciation it would be as much of a money maker as increased business would be.

False Economy.—An answer frequently given to a foreman making application for a new tool is: "We cannot afford it at present—our appropriation for this year has run out," or "orders have been issued to curtail expenses." If economizing or curtailing of expenses meant closing the shop, or repairs could be neglected, it would not be necessary to get a new tool. This is not the case, however. On the contrary, when orders are sent out to curtail expenses, locomotives and cars are generally run for a longer period before being shopped for general repairs. This adds more work to the outlying repair shops and if proper tools are not provided it is a rather expensive economy. An investment for a tool in cases of this kind will often earn the entire cost price in one year.

Folly of Not Providing Proper Tools.—With some tools, however, it would be a difficult matter to estimate the saving in dollars and cents. For instance, the writer was employed in an engine house some time ago to which a machine shop was attached in which about six men were kept busy continuously. All lathe, planer and shaper tools, also twist drills, were ground on a grindstone. It was a small stone and was supposed to be round, and even when in that condition it was slow work grinding a tool properly. The result was that men wasted time grinding tools and also wasted time in not keeping them sharp on account of the trouble of grinding them. Efforts had frequently been made to get a better stone, but none was provided. A machine for grinding twist drills would also have paid for itself in this place. It is almost impossible to estimate the amount of money lost with improperly ground twist drills. These are only two out of numerous instances that have come to my notice in which money was constantly being lost in not providing proper tools.

Care of Tools.—After tools are provided they must receive proper care and should be worked to their full capacity. A tool capable of being driven at high speed will not pay for itself unless provided with a cutting tool that will stand the speed. The same tool, even if provided with a proper cutting tool, would still be losing money if the bearings were allowed to run dry so it would not be capable of working to its full capacity. I have seen instances of machine tools that would not move for want of lubrication. This happened simply because the men were kept so busy they did not have time or inclination to properly lubricate them. If a certain time had been designated for oiling, such as the beginning of the day's work, for instance, the tools would never have been in this condition.

This tool question on a large railway system has such vast possibilities for economy that it should be followed up closely.

The Men and the Tools.—In this connection it is appropriate to mention the men operating the tools. These men in a certain sense can be classed as tools and in some instances receive no more consideration than a tool, and a rather poor tool at that. In most engine houses, even where there is a place for the men to make repairs under shelter, there is no place provided for them to wash. In some cases they have not got closets to hang their clothes in and in a general way they are treated as though they were only a necessary evil. The result is that the quality of mechanics employed in engine houses has deteriorated. Of what use is a good tool in the hands of an incompetent man? What reliance can be placed on the repairs made by this man?

Would it not pay to offer some encouragement to intelligent young men and boys to take up engine house work? At present an intelligent young man may be promoted to the position of engine house foreman, but I am afraid that is exactly what helps to scare him away. However, this tool question is so broad and the amount of discussion concerning it at present shows that it is receiving such an increasing amount of attention, that we can look forward with hope for better things to come.

THE CARE AND MAINTENANCE OF LEATHER BELTING.

BY A. D. PORTER,
Shop Efficiency Inspector, Canadian Pacific, West Toronto, Ontario, Can.

Poor Belt Maintenance and Its Effect on Output.—If a machine stands idle during working hours, while the belt is being repaired or tightened, it produces nothing during that time, and there is a distinct loss in output. If it stands idle for one-half hour in ten hours' working time there is a loss of 5 per cent. in its output, and if in a shop having 100 machines ten machines lose one-half hour each day on account of repairs to belts it amounts to a loss of 0.5 per cent. of the total output of the shop. This, however, is probably not so serious as the loss in output due to belts being run so loose that they cannot begin to take the speeds, feeds and depth of cut for which the machines were designed and that the tools will stand. Almost every efficiency engineer in attempting to bring up the speeds of his machines to what he knows is possible has found that such attempts usually result in the belts slipping and breaking, or the lacings giving out, and he knows that where the care of belts is left to the man on the machine, in only a very few cases can the belts be depended on to do the maximum amount of work. Belts of the best quality must be used at proper tension, and they must be kept in first-class condition and inspected outside of working hours. Very few machinists, or even foremen, know how to tighten or lace a belt properly, the amount to be taken out being usually guessed at, and much time is lost through the machines standing idle while the cutting and trying is going on. I have known cases where good machinists have run cone belts, which have been made too tight, on "cross cones," i.e., on steps not in line with each other, the result being that the belt twisted itself up like a corkscrew and was practically ruined.

Proper Method of Lacing.—It is safe to cut belts 2 in. short in every ten feet of measured length. To lace with leather lacings, butt the ends of the belt together, being careful that the edges are cut exactly at right angles to the belt. Holes should then be cut in the belt with an oval punch, making the larger diameter of oval parallel with the sides of the belt. The holes should be punched as nearly as possible according to the following table:

Width of belt.	Punching lace holes, from ends of belt— First row.	Second row.	Centers of outer holes on row near ends of belt, to be distant from each edge of belt.	Size of lace leather to be used.
2 to 4 in.....	3/8-in.	3/4-in.	3/8-in.	3/16-in.
6 " 8 "	1/2-in.	1 in.	1/2-in.	1/4-in.
10 " 12 "	5/8-in.	1 1/4 "	5/8-in.	5/16-in.
14 " 16 "	3/4-in.	1 1/2 "	3/4-in.	3/8-in.
18 " 20 "	7/8-in.	1 3/4 "	7/8-in.	7/16-in.
22 " 24 "	1 in.	2 "	1 in.	1/2-in.

The best method of lacing a belt is shown in Fig. 1; the lacing on the pulley side of the belt runs parallel with the belt and is crossed on the opposite side.

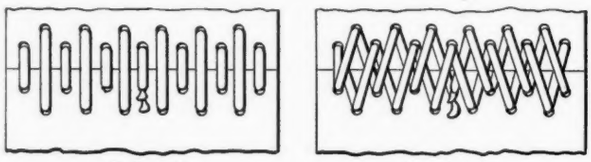
Belt Tension.—Belts put on too tight produce excessive strain on the pulley bearing and consequent loss of power and output. Belt clamps, Fig. 2, having spring balances between the pair of clamps, should be used for measuring the tension accurately each time the belt is tightened. They should be tightened in this manner to give the following pressure per inch of width, with an arc of contact of 180 degrees:

3-ply about 47 lbs.	5-ply about 63 lbs.	7-ply about 80 lbs.
4-ply about 57 lbs.	6-ply about 70 lbs.	8-ply about 95 lbs.
	10-ply about 140 lbs.	

Clamps for tightening belts, as shown in Fig. 2, can easily be made in various sizes to suit the different belts.

Cemented Splices.—Cemented splices, when properly made, give the best results and are being adopted by most up-to-date machine shops. The ends of the belts are beveled and then firmly cemented and rolled or pounded together and allowed to dry thoroughly before being run on the pulleys.

Keep Belts Clean.—One of the most important points in the care of belts is to keep them clean. All belts should be examined frequently, and the greasy or dirty ones scraped to remove all surface dirt. They should then be washed with warm water and soap, care being taken that the water is not too hot to be uncomfortable to the hands. Very dirty or greasy belts can be cleaned with a mixture of two parts of gasoline and one part of turpentine, but remember that this mixture is highly inflammable and must be kept away from open lights and fires; then scrape the loosened dirt off with an old file or dull knife, and wash again if you have not reached bare, clean leather. When the belt is dry it should be given a light, even coating of castor oil on the working side, and if very dry, on both sides.



Pulley side. *Opposite side.*

Fig. 1—Correct Method of Lacing a Belt.

A Good Belt Dressing.—A good formula for a surface compound for belts is: Equal parts of red lead, black lead, French yellow and litharge. Mix with boiled linseed oil and add enough japan to make it dry quickly. A thin coating can be applied with a brush and should be allowed to dry before running the belt. There are several good preservative foods or dressings manufactured by reliable firms which may be applied to belts after cleaning and from which splendid results have been obtained, as shown by experiments, records and data kept before and after treatment.

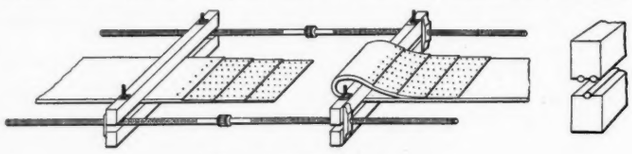


Fig. 2—Belt Clamp.

Belt Shifters.—A shifter having rollers should be used when the belt is a wide one. These rollers should press against the flat of the belt, not the sides, thus avoiding heating and damaging of the edge of the belt. Near each pulley on the lineshaft, where a belt drives a machine that is liable to stand idle for some time, a staple should be driven into the rafters or ceiling.

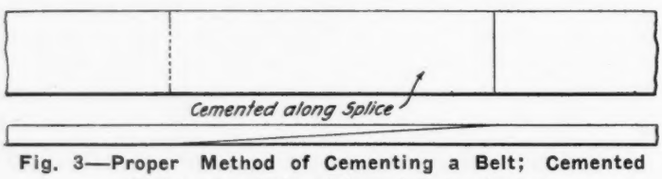


Fig. 3—Proper Method of Cementing a Belt; Cemented Splices Are Being Adopted Extensively.

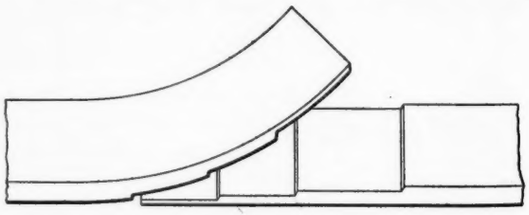


Fig. 4—Best Method of Cutting a Lap Splice for a Composition Belt.

A hook of ⅜-in. round iron should be hung from the staple; it should be made long enough to reach almost to the rim of the pulley, but a little to one side of it. When a belt is taken off its pulley it should be hooked up by the belt stick, the slack of the belt allowing it to be caught on the hook. When the belt sags

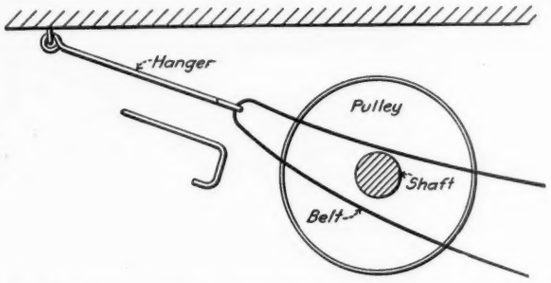


Fig. 5—Arrangement for Hanging Idle Belt to Clear Pulley and Line Shaft.

the hook should swing so as to make the belt clear the side of the pulley and also the shaft, as shown in Fig. 5. This avoids the tieing of belts to beams, hangers, etc., or of leaving them hanging on the revolving shaft, causing the belt to be worn through or weakened. It is very little trouble to hook them up.

Keeping Track of the Belt Repairmen.—In large machine shops and factories where a great number of belts are used a recording board, as shown in Fig. 6, has been used to advantage for keeping track of the belt man and keeping him informed as to the department or section of the works in which his services are required. Each of the top holes in the board has a number corresponding to a department or section. Near the center of

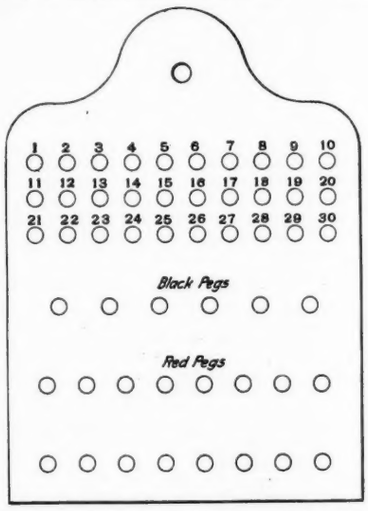


Fig. 6—Recording Board for Belt Repairman.

the board is a row of holes having black pegs inserted in them, and at the bottom of the board are two more rows of holes, in which red pegs are inserted. These lower holes are numbered from 1 to 15. When the belt man is wanted one of the numbered red pegs is put in the hole at the top to show the department where a belt requires attention. When the belt man returns he sees at a glance where he is wanted. Before he leaves the board he replaces the red peg with a black one. The first party coming to the board uses red peg No. 1, the second No. 2, and so on, thus letting the belt man know where to go first.

Belt Guards.—All belt drives within reach of persons standing on the floor, or on adjacent platforms, such as drives to emery wheels, etc., should be carefully guarded by wire screens of not less than 1-in. mesh. These are light and can be easily removed when it is necessary to get at the belt.

General Suggestions.—In conclusion, let me offer a few suggestions.

1. The best belt speed is from 4,000 to 4,500 ft. per minute.
2. To find the velocity of a belt, multiply the diameter in feet of the pulley by the number of revolutions of the pulley by 3.1416; this gives the velocity in feet per minute.
3. Never overstrain a belt, as this produces unnecessary wear of belts and machinery and causes great loss of power by friction.
4. Do not throw on belts when pulleys are running at an extremely high rate of speed.
5. Do not run belts exceedingly tight, as the best service and greatest power are derived by their being just slack enough not to slip.
6. A steel tape is best in taking measurements for belting; other methods are less reliable.
7. A light belt on a large pulley is preferable to a thick belt on a small pulley.
8. The better you look after your belts the fewer machine failures you will have, which means less worry and more money.

THE CARE OF SHOP TOOLS.

BY W. W. REEVES,
Machinist, Illinois Central, Burnside Shops, Chicago, Ill.

Institute a system, and don't abide by a custom. Remember that changes come swift. Have a place for everything, and keep everything in its place. There is no system like the check for keeping track of tools, and as hunting for mislaid tools means time, and time is money, check your tools, just the same as the time of your men.

Have a censor for the scrap pile, and don't allow good material to get there.

Make some kind of a tool room in the engine house and put some one in charge of it. Check out tire heaters, hydraulic jacks, small jacks, crosshead extractors and all other appliances, just the same as you would other small tools, and then they will come back.

For the engine house machinist a tool box fastened securely to a truck, with individual wrenches, sledges, etc., is a good idea and saves many trips to the cupboard or tool room during the day.

The superintendent or master mechanic whose artistic sense of cleanliness is such that he will not leave enough pit-planks, small blocks, wooden and iron wedges and shims lying around to work with is guilty of criminal carelessness. Make a place for them and keep them in abundance; they are great dividend payers.

Remember your engines are larger than formerly, and make your pinch bars in proportion. It is a pitiful sight to see two little Austrians trying to move a 135-ton engine with a 4-ft. bar that belonged to the crop of 1884.

Construct or design a rack, or have a place where these heavy tools can be kept and found, and keep enough to go round. If the plant is large much time can be saved by serving recut files from the tool room, taking an old one in exchange for a new one. Do the same with the chisels. Have a man continually working on air hose, and let him examine and report all leaky pipe joints. Don't let a mechanic have to hunt two hours or more for these things and expect him to get a job out on time. Keep your motors well oiled, and also parts to repair them with, and if you must use old, worn-out drills, see that they are tempered.

Leave enough scrap around so a temporary bolt can be found without making a new one for a short job, only to be thrown away again.

Save and retap your old nuts and keep them, as well as old washers, in special size boxes in the engine house and backshop; they are worth their weight in gold. See that your tool room has a kit of pipe wrenches for common use; also a spirit level, screw driver, 2-ft. square and tin shears.

Keep a man that knows his business on belts, emery wheels and grindstones; the former are costly, and the latter are dangerous when not properly taken care of.

Don't persist in keeping a lot of old, worn-out taps and reamers in circulation; they are a joke, and a costly one at that.

Invest in high-speed drills and machine tools; it might pay to keep them in the tool room, and have a regular man grind them.

It is a good plan to let special men, like the "truck" or "steam-pipe" men, have their own outfits, with motor, drill brace, hose, etc., but for the rest, let them go to the tool room, and have plenty of these things there. Brains, like steel or anything else, cost money, but try and purchase enough brains in your "boss sweeper" so that he will pick up derelict oil cans, broken punches, chisels, etc., and save them from the scrap pile.

Few foremen seem to appreciate the value of a wedge, judging by the way they are allowed to be burnt up, if of wood, or sent to the scrap pile, if of steel; yet these things are in demand every hour in the day, and hours are spent looking for them.

A "bogie" or "buggy" bar is a handy tool; so is a "barrel" wrench; yet it would take a microscope to find either in some shops. A steel drift to draw the strap rod together is also a good thing and saves the bolt during the process. Don't allow a jack of any kind to stand around lonesome and neglected without a lever; it is a costly process. Give your doctors in the "repair hospital" practice enough to keep your tools in good order, and see that they are checked out and in. In closing, it is not the vast quantity of mechanical puzzles you have around the plant that counts, but it is the facility with which you can secure the necessary simple tools to do a commonplace, every-day job, and to know where they are.

SMITH SHOP TOOLS AND PRACTICES.

BY J. F. PERRITT,
Blacksmith Foreman, Seaboard Air Line, Jacksonville, Fla.

One of the most difficult problems in modern railway shop management is for a blacksmith foreman to keep his department abreast with the times by successfully competing with the output and the quality of work done in other shops on the system or shops of competing railways. This because of the fact that within the last few years the introduction of such machines as bolt headers, forging machines and bulldozers in the smith shop has so greatly increased the facilities for doing more work, and work that is more uniform, that the conditions which formerly existed in this department have been almost completely revolutionized, and the foreman with the most machines, or the most modern machines, has a decided advantage over the man without them.

If the management will buy these machines after the foreman selects them and shows the need of them, there will be easy sailing, as the majority of the tools made to use on these machines are designed on a uniform principle, and should the smith foreman lack the ingenuity to make them, the manufacturers of the machines, in order to increase their sales or the popularity of their machines—in other words, as a matter of business—will gladly furnish any assistance requested in getting up tools. However, if for some reason the management refuses to purchase the machines selected and required, still expecting results both in amount and quality of work, an extra effort is required on the part of the foreman to design and build, or build after some other fellow's design, any tools, such as steam hammer tools, formers, air presses—or air machines, as some call them—and tools for the air presses, that in his opinion will assist in increasing his facilities.

While no air press that has come under my observation can successfully compete with the modern manufactured machines, they do help materially in increasing the output and making it of a uniform quality; the cheapness in building an air press, as compared with the price of a modern forging machine, is the principal thing that furnishes an argument in their favor. Such an air press and some of the tools used on it are shown in Figs. 1 and 2. This I have recently made, and on some work it will compete with a forging machine or bolt header; as a general proposition, however, it will not. It was built partly during spare time, partly with stolen time, and chiefly from scrap material. With an air pressure of about 100 lbs. we have an approximate pressure on the grip or vise of 21,500 lbs., and a pressure from the main cylinder or plunger of approximately 40,000 lbs. The dimensions given furnish 4½ in. travel to the plunger, which so far has proven to be sufficient. This press has been of so much assistance that I am seriously contemplating building a larger one, to be used only on large work, as doing small work on a large machine would be an extravagant waste of air. As may be seen from both the sketch and the photo, there is plenty of room for improvement or changes, and I

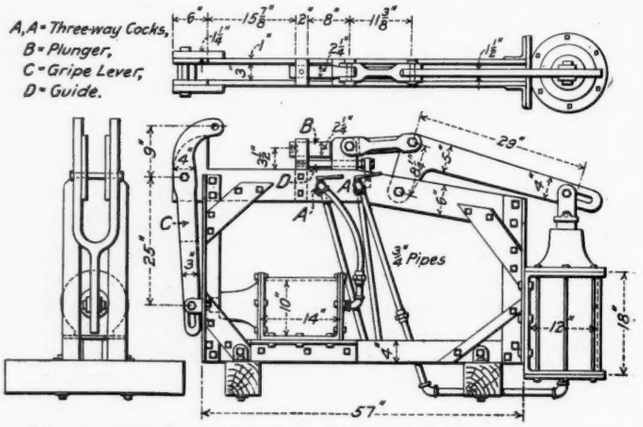


Fig. 1—Air Press for Bolt Work and Light Forging.

intend making several improvements as the opportunities arise.

Two tools used on another air press, with a travel of 14½ in., built on the same plan as most presses affording a straight pressure, are shown in Fig. 3. The tool on the left for making straps for air reservoirs is a double tool; it may be reversed on the press by removing the bolts and turning it around. The arms connecting with the head pieces are interchangeable, so as to require only one pair. The straps made are for 10 in. and 12 in. reservoirs. The tool on the right is for making car steps with two bends and two quarter twists, such as shown in the illustration. This tool was suggested to me by a traveling sales-

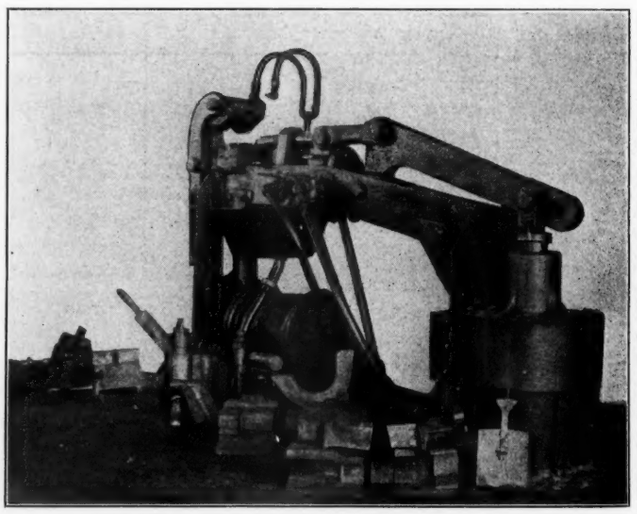


Fig. 2—Air Press for Light Forging.

man who was formerly a blacksmith foreman with the Southern Railway. I consider it the best step tool I have ever seen, as the step is completed in one heat with one stroke; in most cases, the number of steps bent on this tool in any given time is only limited by the capacity for heating them.

One of our tool racks and the method of keeping formers used under steam hammers, so that they can be found easily when needed, is shown in Fig. 4, the piece of work hanging on the same hook with the former with which it is made. This enables the smith, particularly a new man, to find the former

without any waste of time. The steam hammer swages, not shown in the photo, but on another rack, are kept in like manner, arranged in rotation from the smallest to the largest sizes; each swage has the size marked on it. This arrangement also saves considerable time. On another rack we keep various tools for steam hammer use, each tool being placed so that it can be found the minute it is wanted. Of course, if the task of keeping these tools in order is left to any and every one, they will not remain in order long; in our case an old helper is assigned to

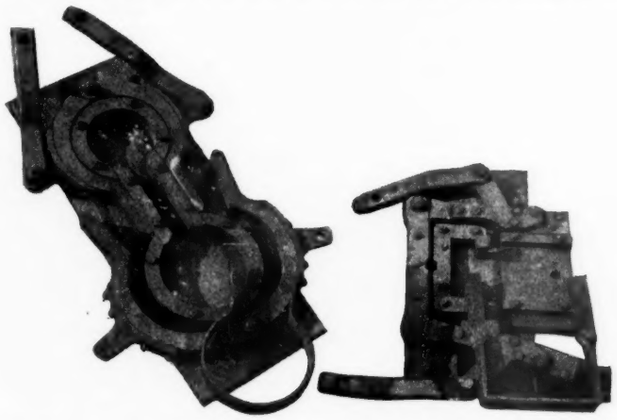


Fig. 3—Two Typical Tools Used on a Large Air Press, or Bulldozer.

the task of keeping the shop clean and these tools in order. About once a month he oils the working parts of the tools, using a piece of cotton waste and some cheap black oil. This is particularly necessary in a heavy, damp climate, where such tools rust quickly.

While forging machines have done a great deal toward displacing the steam hammer formers, the latter are still helpful, even where a foreman has his shop equipped with modern machines, as there are numerous jobs that can be done easily with a hammer tool that would be difficult and in some cases impos-

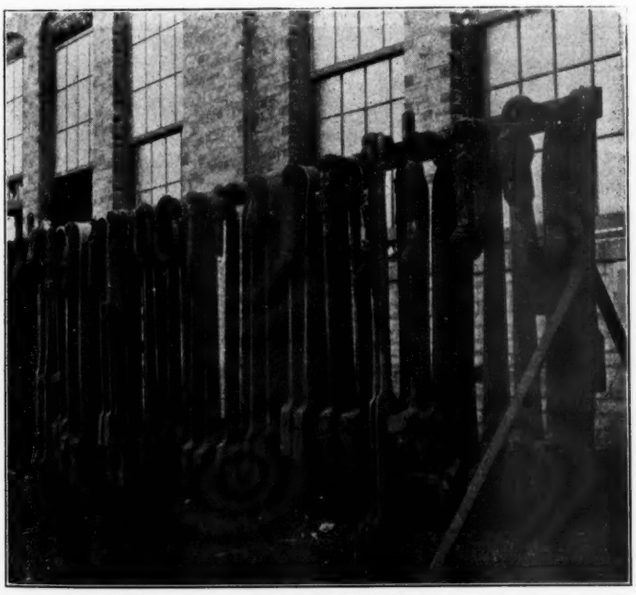


Fig. 4—Rack for the Storage of Steam Hammer Formers.

sible to do with a forging machine. A hammer tool for making and dressing claw bars, Fig. 5, is a convenient device and a big money saver wherever used. The cost of making wrenches of any ordinary size can be reduced to a minimum by the use of hammer formers and punches.

One of the greatest helps derived from a good selection of hammer formers and swages is that with them one is able to utilize considerable scrap iron and steel that would be hard to utilize otherwise. A convenient way of keeping these tools in order and maintaining a standard of the various articles made with them is to have the original piece with which the swage or

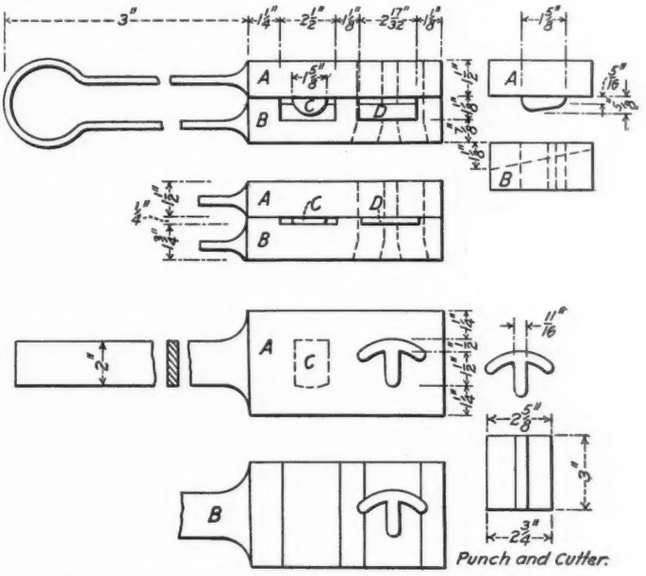


Fig. 5—Hammer Tool for Dressing Claw Bars.

former is made. It should be made of soft steel exactly the shape and size required, and after the first tool has been made with it, it should be kept for the purpose of working over old tools and making a new one when an old one breaks; in this way a great deal of time is saved and standards are maintained.

MANUFACTURE, MAINTENANCE AND DISTRIBUTION OF SMALL TOOLS.

BY C. J. DRURY,
Master Mechanic, Atchison, Topeka & Santa Fe, Arkansas City, Kan.

CENTRALIZED MANUFACTURE OF SMALL TOOLS.

Economical work depends upon the tools used, the condition in which they are kept and their availability for service when needed. The manufacture of small tools should be centralized, the principal shop being equipped to do this work. With this practice the tools are made standard, and the old practice of carrying thousands of dollars' worth of tool steel on racks at outside points to rust away can be eliminated. We should even go so far as to stop the dressing of tools at local points, which practice allows us to drift from our standards.

You are familiar with the great difficulty experienced when the simple little flue beading tool is allowed to be forged and finished at every division point. This is very noticeable when locomotives are transferred from one division to another.

The continued dressing of the large tools, such as used on planers, wheel lathes and other heavy machinery, soon makes them too short and they are allowed to be set aside, whereas if the practice of making and dressing them at one point is adhered to the scrap pieces may be worked up into small tools and sent to some other point where needed. How often has a certain special tool been made at some small plant, a bar of steel having been ordered ranging anywhere from 50 cents to $1 a pound. The amount necessary for the tool is cut off, and the bar is set aside and soon forgotten.

The cost of shop machinery and tools is certainly no small item on our large railways, in some instances representing a yearly expenditure of over a quarter of a million dollars.

This centralizing of the manufacture of tools was inaugurated on the Atchison, Topeka & Santa Fe some four or five years ago and has brought about great reductions in the tool account,

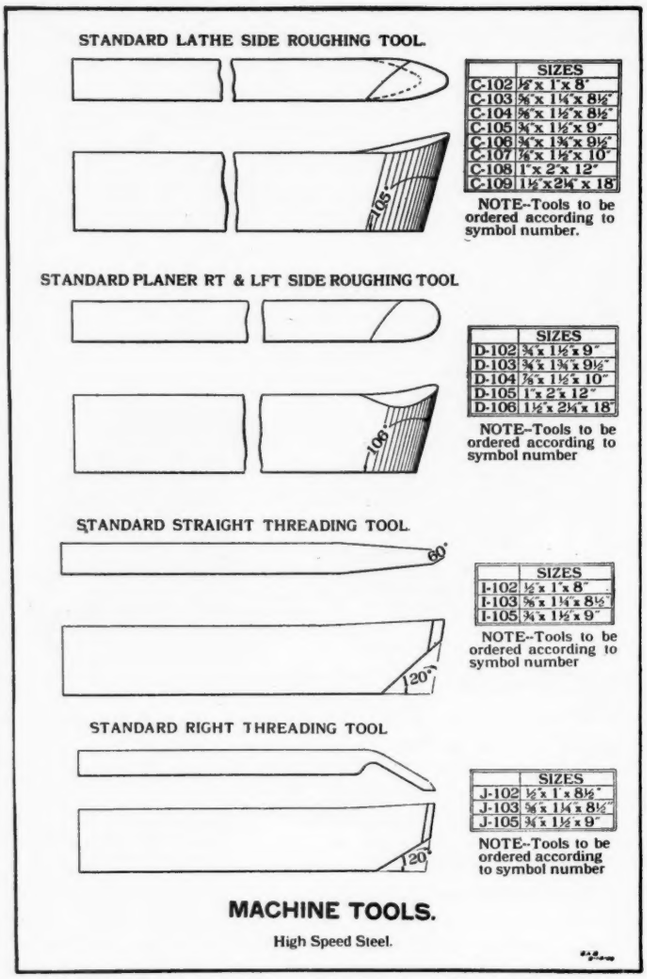
as well as increased shop output. The Santa Fe at present has as near an ideal system of handling tools as any railway in the country. The tools are manufactured at one point and are delivered to the general storehouse and held in stock subject to requisition from outside points.

DISTRIBUTION OF TOOLS.

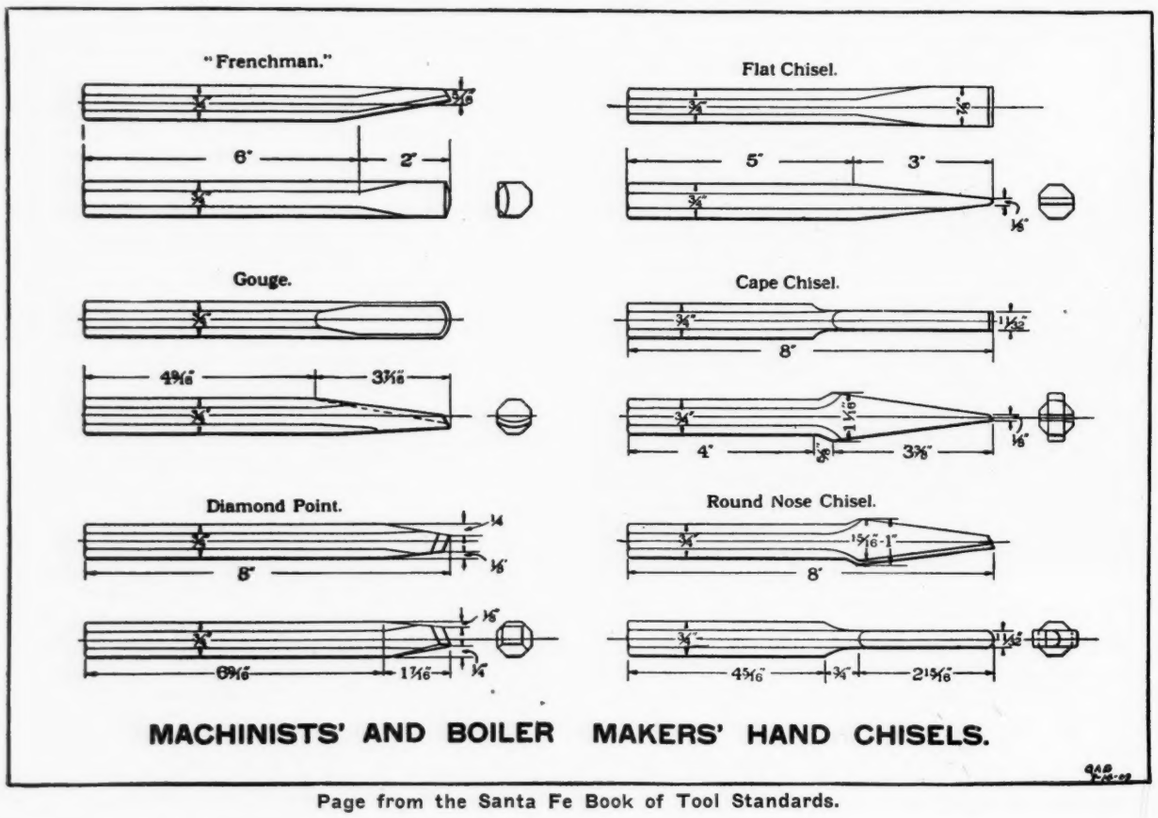
Requisitions made at all points or divisions must be approved by the assistant superintendent of motive power after being checked by the tool supervisor. A stock book is kept at all points, which is posted monthly, showing the tools on hand, the number and kind, also the number and kind ordered, with attached requisitions for the month's supply. This is mailed at the end of each month to the assistant superintendent of motive power for approval, and after being passed on in his office, where the requisitions are approved, changed or cancelled, the book is returned to the division. Foremen are all points are supplied with a catalogue, showing the standard tools carried in stock at the general storehouse. The illustrations show two typical pages from this catalogue.

After tools are received and placed in the tool room for issuing to employees, the check system is used. In case of lost or broken tools, a tool breakage clearance is required, made out and signed by the foreman; it must also bear the personal signature of the general foreman. In this way we are able to locate carelessness or ignorance in the handling of the tools by the workmen. At the close of each month the clearance cards from all shops are sent to the supervisor of tools. Information is thus obtained regarding defective design and construction of tools and recommendations are made for the improvement of the tool service. (The clearance card is shown on page 873. The article in connection with which it is used was written before Mr. Drury's paper was received, and, in a way, supplements it.)

The tool supervisor for the system sees all requisitions for tools and shop machinery. He is familiar with the equipment at each point; for example, a requisition may be made for some machine, perhaps an emery wheel stand. The tool supervisor, being acquainted with the tool condition of the system, may be able to fill the requisition from some other point, saving the purchase of new stock. This practice obviates the keeping of


STANDARD LATHE SIDE ROUGHING TOOL.
SIZES
C-102 ⅝ x 1" x 8"
C-103 ⅞ x 1¼" x 8½"
C-104 ⅞ x 1½" x 8½"
C-105 ¾ x 1½" x 9"
C-106 ¾ x 1¾" x 9½"
C-107 ⅞ x 1½" x 10"
C-108 1" x 2" x 12"
C-109 1½" x 2¼" x 18"
105°
NOTE--Tools to be ordered according to symbol number.
STANDARD PLANER RT & LFT SIDE ROUGHING TOOL
SIZES
D-102 ¾" x 1½" x 9"
D-103 ¾" x 1¾" x 9½"
D-104 ⅞" x 1½" x 10"
D-105 1" x 2" x 12"
D-106 1½" x 2¼" x 18"
105°
NOTE--Tools to be ordered according to symbol number
STANDARD STRAIGHT THREADING TOOL.
60°
20°
SIZES
I-102 ½" x 1" x 8"
I-103 ⅝" x 1¼" x 8½"
I-105 ¾" x 1½" x 9"
NOTE--Tools to be ordered according to symbol number
STANDARD RIGHT THREADING TOOL
20°
SIZES
J-102 ½" x 1" x 8½"
J-103 ⅝" x 1¼" x 8½"
J-105 ¾" x 1½" x 9"
NOTE--Tools to be ordered according to symbol number
MACHINE TOOLS.
High Speed Steel.

Typical Page from Santa Fe Book of Tool Standards.



Page from the Santa Fe Book of Tool Standards.

expensive tools idle in one place when they are needed in another.

MAINTENANCE OF TOOLS AND MACHINERY.

To efficiently maintain these tools we have found it important that the operation of our machines be specialized. Our men thus become more proficient in the care and handling of their machine and tools than if switched from one machine to another. The constant changing of men on machines also allows the efficiency of our shop to decrease. The apprentice instructor should impress upon the boy the necessity of carefully handling his machine and regularly oiling it, and of keeping the bearings properly set up and adjusted, so that the machine can be crowded to full capacity without a breakdown.

Special men should be assigned to the repair work of machines, motors, shafting, hangers and belting. We not only get better results relative to the work performed, both quality and amount, but lessen the liability of accident. The proper maintenance of pneumatic tools is most important in the handling of an efficient shop. Experience has taught us that the maker's instructions regarding the care of such tools are very good rules to teach our apprentices and mechanics. These should be posted throughout the shops, and the foreman should see that they are rigidly carried out. It must be understood that air, steam and water leaks around the plant and shops help to depreciate the machinery. Boilers, air compressors and pumps soon wear out. The foremen should follow this up closely, seeing that such defects are given attention at the proper time, which will help the tool account. The tool room foreman in making his weekly or monthly inventory should be as eager to report a surplus tool as he is to order a needed one, thus helping out some other tool room without any increase in the account, at the same time getting credit for his own shop.

In solving the tool question we find that to carry on an efficient system we must keep in vogue the following rules:

Centralize and standardize the manufacture.

Systemize the distribution.

Specialize the operation.

THE CARE AND MAINTENANCE OF MACHINE TOOLS AND SHOP EQUIPMENT.

BY W. J. EDDY,
Tool Room Inspector, Erie Railroad, Meadville, Pa.

The care and maintenance of machine tools and shop equipment is a question of no small magnitude with several of the large trunk lines. To keep in step with the rapid strides in improved design of machine tools and shop equipment we are compelled to give more thought and attention to the latest methods of operation. Designing machines and shop equipment by the well-known methods of calculation is a comparatively easy task. But there are so many unknown elements entering into the actual operation of the equipment and so great a factor of safety has to be added that in the end it is little better than guess work. Therefore, the designs of the future are strengthened by the failures of the present equipment.

Too much care and attention cannot be given machine tools. A machine operator who keeps his machine clean, the small tools on the tool board or in the cabinet for that purpose, and who does not permit his machine to get in a disorderly condition will produce a greater output than a negligent operator. Machine tools kept sharp by a systematic method of tool grinding will help to produce this greater output. This systematic method of tool grinding can be obtained by the installation of an up-to-date machine tool grinder in the tool room and by carrying in stock a sufficient number of standard tools ground to standard angles to supply the demands of the machine operators.

The proper care and maintenance of machine tools and shop equipment can only be accomplished by a systematic method of shop equipment failure reports and complete records. By the use of such failure reports and records and a careful study of them the design and selection of new equipment is determined. Such a system is outlined below. Every machine tool and all shop equipment on the entire system is numbered, and a complete record is taken on standard 6 x 9-in. cards. These records are then filed in numerical order under the several shop headings. which readily locates all shop equipment in each shop. An index arranged in numerical order, regardless of shop location, readily locates any tool or piece of shop equipment by the number. By referring to the several record cards described, which cover machines, motors and generators, engines, air compressors, stationary boilers and shop air reservoirs, it will be noticed that complete information is given, which the superintendent of piece work or any general officer is able to obtain at a moment's notice.

A sample of the machinery record is shown in Fig. 1. This form is prepared to take a full record of all machines, giving complete information relative to feeds, speeds and distances, especially the distance between the counter and line shafts, in order that the best of belt conditions will exist. When a new machine is installed the next highest number is assigned from the general office, and this form is filled out in detail and forwarded to the general officer in charge. The form is then filed under the shop heading in filing cabinet. Whenever it is necessary to transfer a machine from one shop to another, it is so indicated on the form, giving the date of transfer, and it is filed under the shop heading to which the machine has been transferred.

The motor and generator record is shown in Fig. 2. It gives all the information necessary for a complete description and enables the electrical engineer to check up the electrical equipment in each shop at any time.

The stationary engine record is shown in Fig. 3. Each stationary engine on the system is assigned a number, regardless of location, and the forms are filed in numerical order. This form gives complete information covering the engine, which is easily available at all times.

The air compressor record is shown in Fig. 4. Each air compressor is assigned a shop number, and a detailed description is taken on these forms and filed in numerical order, regardless of location. Whenever a compressor is transferred to any other shop it is so marked on the card.

A complete record of all stationary boilers on the system is kept on the form shown in Fig. 5. These forms have an outline sketch of the boiler on the reverse side. Each boiler is assigned a number from the general office, and forms are filed in numerical order under each division. A semi-annual inspection and test of all stationary boilers is made, and complete records are kept of each test and inspection. The numbers are applied to the boilers on brass plates, which also show the steam pressures they are supposed to carry.

The shop air reservoir record is shown in Fig. 6. Each reservoir is assigned a shop number, and forms are filed in numerical order under each shop heading. Every three months each reservoir is given a hydrostatic test, washing and inspection; the air gages and safety valves are also tested and cleaned. The washing and testing are reported on the form shown in Fig. 8, and on receipt of this advice the date of the last test and washing is marked on the reverse side of the shop air reservoir record, and the reports are filed in numerical order.

Whenever a number is assigned to any piece of shop equipment it remains for all time; if the equipment is transferred, the number is also transferred. If a new machine or any piece of shop equipment is purchased to replace worn-out equipment, a new number is assigned, and the old number is scrapped with the old machine. Whenever a machine is scrapped and replaced by a new one it is so indicated on the record sheets, giving the date scrapped and number of the machine which takes its place.

Tool Failures.—The shop equipment failure card is shown in Fig. 7. Whenever a machine or any shop equipment fails in any way it is immediately reported to the general office on this card. This enables the general officers to know at any time the exact number of machines or equipment out of commission in each shop. When the repairs are made and the machine is in com-

MACHINERY RECORD.

Shop ____ Kind of Machine ____ Transferred or New ____ Shop No. ____
Location ____ Builder ____ Builder's No. ____ Jobber ____
Date Purchased ____ Requisition No. ____ P. A. Order No. ____ Cost ____ Terms ____
Date Received ____ Date Installed ____ Transferred to ____ Date ____

DESCRIPTION.

Attachments
Arbor: Diam.
Bed: Length, Diam.
Bed: Width ____ Height from Floor
Bolt Cutter Heads, No. ____ Size
Countershaft: No. of Speeds
Countershaft: Pulley, Friction or Shifting Belt
Countershaft: Pulley, Diameter ____ Width ____ R P M
Cone: No. of Faces ____ Width of Face
Cone: Diam., Smallest and Largest Step
Chucks: No. ____ Kind ____ Size
Crosshead—Hand or Power Adjustment.
Cutters: Max. Diam.
Distance Center Counter to Line Shaft
Distance Center Counter to Lathe Spindle
Distance Between Centers ____ Between Housings
Face Plate: No. ____ Size
Feed Box: Gear or Belt
Feed Cross: Hand or Power
Feeds: No.
Feeds: Min. per Rev. or Stroke
Feeds: Max. per Rev. or Stroke
Foundation Dimensions
Gear: Back, Double or Triple
Head: Size Hole in Centre Drive Machine
Line Shaft: Diam. ____ R. P. M.
Line Shaft Pulley: Diam.
Motor or Belt Drive
Motor H. P or Size of Belt

Motor R. P. M.
Motor Builder
Motor No. ____ Type
Motor D. C. or A. C.
Motor Volts ____ Amps.
Motor Field Serial No.
Motor Brushes
Motor Brushes No. ____ Size
Pumps: No. ____ Kind
Pan: For Cutting Fluid
Rests: Steady
Rests: Follower
Swing: Max over Ways ____ Max. over Carriage
Spindle: Diam. of Hole
Speeds, Spindle or Cutting: No.
Speeds: Max. R. P. M. or F. P. M.
Speeds, Spindle or Cutting: Min. R. P. M. or F P. M.
Speeds, Ratio: Cutting to Return
Tool Post: Plain or Compound
Tool Post: No. ____ Size
Tool Carriers: No. ____ Size of Shank to Fit Turret Head
Tool Steel: Size
Turret
Tail Stock: Hand or Power Adjustment
Total Dimensions of Machine
Power Press: Type ____ Capacity Tons
Power Press: Maximum Dimensions
Power Press: Plunger or Screw Diam.
Power Press: Max. Travel of Plunger or Screw

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Fig. 1—Record Card for Machine Tools.

MOTOR AND GENERATOR RECORD

Location ____ Class ____ No. ____
Jobber ____ Builder ____ Transferred or New ____
Req'n No. ____ P. A. Order No. ____ Spec. No. ____ Cost ____ Terms ____
Date Purchased ____ Date Received ____ Date Installed ____

DESCRIPTION

Amperes ____ Volts ____
Bed: Length ____ Width ____
Belt Wheel: Diam. ____ Face ____
Cycles ____ Poles ____
Distance Center of Motor Shaft to Center of Main Shaft or Jack Shaft
Distance Center of Generator Shaft to Center of Engine Shaft
Generator: Belt Driven or Direct Connected
K. W. or H. P.
Location in Shop
Motor or Generator Shaft: Diam.

Method of Wiring in Shop
No. of Engine or Motor Driving Generator
Speed: ____ R. P. M.
Total Length ____ Width ____ Height ____
Work Required of Motor or Generator

NOTE ON CLASS

MP—Multipol Direct Current.
IS—Single Phase Induction Motor
IQ—2 Phase Induction Motor.
I—3 Phase Induction Motor
ATI—Alternating 3 Phase Synchronous Motor.
ATS—Alternating 3 Phase Revolving Field Generator
AQS—Alternating Quarter Phase Revolving Field Generator.
AQ—Alternating Quarter Phase Revolving Armature Generator.
AT—Alternating 3 Phase Revolving Armature Generator

Fig. 2—Record Card for Motors and Generators.

STATIONARY ENGINE RECORD.

Location ____ Type ____ No. ____
Jobber ____ Builder ____ Transferred or New ____
Req'n No. ____ P A. Order No. ____ Spec No. ____ Cost ____ Terms ____
Date Purchased ____ Date Received ____ Date Installed ____

DESCRIPTION

Bed: Length ____ Width ____
Belt Wheel: Diameter ____ Face ____
Balance Wheel: Diameter ____ Face ____
Cylinders, High Pressure: Diam ____ Stroke ____
Cylinders, Low Pressure: Diam. ____ Stroke ____
Condensers: Type ____ Builder ____
Condensers: Surface
Dist. Centre of Engine to Centre of Pillow Block
Dist. Centre of Engine Shaft to Centre of Main Line Shaft or Jack Shaft
Exhaust: Diameter
Governor: Type ____ Size ____
Line Shaft Belt Pulley: Diam. ____ Face ____

Pillow Block: Size of Base
Packing, Piston Rod: Kind
Packing, Cylinder: Kind
Packing, Valve Rod: Kind
Piston Rod: Diameter
Valve Rod: Diameter
Engine Shaft: Diameter
Total Length ____ Rated Horse Power ____ lbs. Initial Pressure
Speed: ____ R. P M
Throttle: Type
Throttle: Diam. of Steam Inlet
Valve Gear
Valves: Type
Vacuum

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Fig. 3—Stationary Engine Record Card.

AIR COMPRESSOR RECORD

Location ____ Type ____ Shop No. ____
Transferred or New ____ Builder ____ Jobber ____
Date Purchased ____ Date Received ____ Date Installed ____
Req'n No. ____ P. A. Order No. ____ Cost ____ Terms ____

DESCRIPTION

Air Inter-Cooler: Capacity, cu. in.
Belt Wheel: Diameter ____ face
Circulating Water System: kind
Capacity: cu. ft. free air per min.
Capacity: cu. ft. free air per rev.
Cylinders: Air, H.P. Diameter
Cylinders: Air, L.P., Diameter
Cylinders: Steam, H.P., Diameter
Cylinders: Steam, L.P., Diameter
Cylinders: Stroke
Floor Space: Total Length ____ Total Width ____
Floor Space: Height above Foundation
Fly Wheel: No. ____ Diam. ____ Face ____
Governor: Type ____ Size ____
Horse Power

Pipes: Size of Steam Inlet
Pipes: Size of Steam Exhaust
Pipes: Size of Air Discharge
Pipes: Size of Circulating Water
Packing: Cylinder, Kind
Packing: Piston Rod, Kind
Packing: Valve Stem, Kind
Piston Rod: Diameter
Pressure: Air ____ Steam ____
Speed: R. P. M.
Speed: Piston, Ft. per min
Shaft: Diameter
Throttle: Type ____ Size ____
Valve Gear
Valves: Steam, Type
Valves: Air, No. ____ Size ____

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Fig. 4—Record Card for Air Compressors.

STATIONARY BOILER RECORD.

Location _____ Type _____ No. _____
Locomotive Class Removed from _____ Specification No. _____
Transferred or New _____ Builder _____ Jobber _____ Req'n No. _____
P. A. Order No. _____ Date Purchased _____ Date Built _____ Date Received _____
Date Installed _____ Cost _____ Terms _____

DESCRIPTION	
Draft: Natural, Forced or Induced	Stack: Diameter _____ Height _____
Class of Fuel Designed for	Stack Connection: Size _____
Flues: Number _____ Diameter	Stack Breeching: Small Size _____ Large Size _____
Flues: Length _____	Safe Working Pressure (Form 44-B) _____
Flues: Gauge _____ Spacing	Method of Firing _____
Firebox: Length _____ Width	Mechanical Stokers: Type _____
Feed Water Heater: Type	Method of Boiler Feed Injector or Pump
Feed Water Heater: Dimensions	Ground Space Occupied _____
Grates for _____ Coal	Superheater: Type _____
Grate Area: _____ Sq. Ft.	Superheater: Surface _____
Heating Surface: Flues _____ Sq. Ft.	Superheater Total Dimensions _____
Heating Surface: Firebox _____ Sq. Ft.	Degrees Superheat Leaving Boiler _____
Heating Surface Total _____ Sq. Ft.	Water Columns Type _____
Ratio of Grate Area to Heating Surface	Gauge Cocks No. _____ Distance from crown sheet to lowest
Rated Horse Power _____	1st to 2nd _____ 3rd to 4th _____
Smoke Box Length _____ Diam _____ Width	

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Fig. 5—Record Card for Stationary Boilers.

SHOP AIR RESERVOIR RECORD.

Location _____ Builder _____ No. _____
Jobber _____ Transferred or New _____ Req'n No. _____
P. A. Order No. _____ Spec. No. _____ Cost _____ Terms _____
Date Purchased or Made _____ Date Received _____ Date Installed _____

DESCRIPTION	
Diameter Inside: Maximum _____	Stays: Diam. at Root of Thread _____
Length Inside: Maximum _____	Stays: Diam. at Body _____
Thickness of Sheets in Barrel _____	Stays: Spacing, Diametrically _____
Thickness of Sheets in Head _____	Stays: Spacing, Circumferential _____
Heads: Dished or Straight _____	Stays: Number _____
Circumferential Riveting: Pitch _____	Safety Valve: Make _____
Circumferential Riveting: Diam. of Rivet _____	Safety Valve: Size _____
Longitudinal Riveting: Pitch _____	Safety Valve: Muffled or Open _____
Longitudinal Riveting: Diam. of Rivet _____	Safety Valve: Set at _____
Longitudinal Riveting: Thickness of Inside Welt _____	Blow-off Cock: Distance From Bottom Head to Center _____
Longitudinal Riveting: Thickness of Outside Welt _____	Blow-off Cock: Make _____
	Blow-off Cock: Size _____

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Fig. 6—Record Card for Air Reservoirs in Shops.

mission again a second card is made out, giving the exact cost and time, and is forwarded to the general office. These cards are filed in the numerical order of the equipment number. Whenever the purchase of a new machine is anticipated these equipment failure report cards are gone over, and the specifications are rewritten to cover the weak points in the old design and also to take advantage of the latest improved methods of operation.

Repairs to Tools.—In the larger shops the maintenance of machines and large shop equipment is taken care of by a foreman in charge of a small repair gang of workmen, while the small tools are kept and maintained in the tool room by the tool room foreman and his force. In the smaller shops these two gangs are combined into one, with the tool room foreman in charge.

Belting.—The care and maintenance of belting is looked after by one man in each shop, reporting to the machine repair foreman. This man is provided with a belt lacing machine of the latest design, using the spiral wire lacing. He is also provided with a belt rack or case holding all standard widths of belts from 1 to 10 in. in length, varying in inches. These extra lengths are prepared for lacing. When a new belt is applied it is cut 10 in. short and is taken to the belt lacing machine and prepared for lacing by threading a spiral wire through each end. A 10-in. section is then inserted by simply inserting two pieces of raw hide about ⅛ in. in. diameter, and the belt is applied. After the

FAILURE CARD FOR MACHINES OR OTHER SHOP EQUIPMENT.

Shop _____ *Dept.* _____ *Date* _____ *190*__

Name of Machine _____ *Shop No.* _____

Name of parts other than machines that fail _____

Time of failure _____ *190*__ —A. M —P M *Repairs finished* _____ *190*__ —A. M. —P. M.

Name of part that failed _____

Cause of failure and kind of material that failed _____

Were men sent home? _____ *If so, how many?* _____

Name and description of any new parts either made or purchased _____

Kind of material applied _____

Estimated cost of repairs _____ *Actual cost of repairs* _____

If material is ordered, give requisition reference _____

REMARKS: _____

EXPLANATION.

Report must cover all failures to Stationary Engines, Air Compressers, Dynamos, Generators, Stationary Boilers, Motors, Machines, Steam Hammers, Fans, Shafting and Hangers, Furnaces, Cupolas, Air, Water and Steam Lines, Turntables, and all failures which necessitates shutting down any machine or portion of plant, or result in delay to work.

This card must be made out and sent in to office of Mechanical Superintendent as soon as failure occurs, and should contain all information possible.

If repairs are not completed same day another card should be forwarded showing when machine was put into operation and any further information necessary

Fig. 7—Failure Card for Machines and Shop Equipment.

belt has run for some time and sufficient slack has developed to require attention, the 10-in. section is taken out and a shorter piece inserted. This is done in less than a minute's time and does not interfere with the operation of the machine unless it is in constant motion; in that case it is done at the noon hour or the first time the machine is stopped. The 10-in. length is then put back into the rack to wait until the next application of a new belt. Each month a report is made to the general office showing the total amount spent on belting, both labor and material. This report enables the general office to ascertain the true

belt conditions of each shop, and if the cost is excessive an investigation is made. This has sometimes developed the fact that although the belt when new passed the laboratory test and met the specifications, it failed to hold up in the shop under ordinary shop conditions.

Pneumatic Tools.—Too much care and attention cannot be given pneumatic tools. To keep them in constant serviceable condition they must be closely watched and be kept well oiled, for such high-speed machines confined to so small a space and depending on the close fitting of all movable parts soon become worn. The best lubricant the writer has found for pneumatic drills consists of one gallon of petrolatum thinned with one quart of signal oil. This is injected into the case of the drill every few days. A light oil is used to lubricate the valves and pistons by injecting through the live air handle every five or six hours.

Pneumatic Drills.—When a new drill is received it is assigned a shop number, and a complete record is taken, also a load rating taken from a rope dynamometer. This load rating is used to check against the drill whenever it is turned in for repairs; it should check within 10 per cent. of original rating, or the drill is taken apart and further repairs are made.

Air Hammers.—Air hammers when not in use are kept immersed in a tank containing three parts kerosene and one part signal oil, and before being issued for service are oiled through the handle with a light machine oil.

Report of Safety Valves Tested, Blow-off Cocks Inspected and Repaired, Shop Air Reservoirs Tested, Washed and Repaired

At_____ on the _____ Day of _____ 19____

Reservoir Number	Safety Valve		Blow-off Cocks		Steam Gauges		Reservoir		
	Set at	By whom	Inspected by	Repaired by	Inspected by	Repaired by	Tested at 125 lbs. by	Washed by	Repaired by

Safety valves must be tested and adjusted, blow-off cocks inspected and repaired and reservoir washed and tested under 125 lbs pressure every 90 days and this work must be done at one and the same time

CORRECT:

_____
Master Mechanic

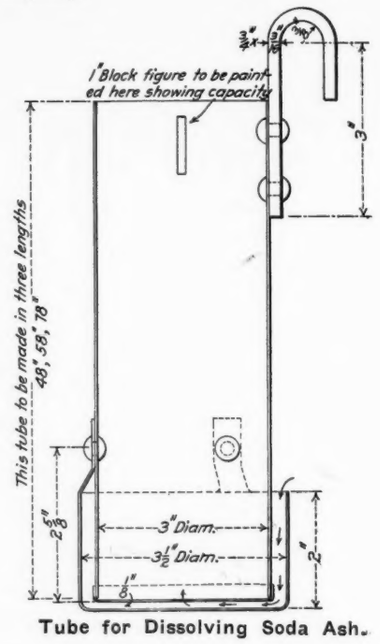
Fig. 8—Form for Reporting Safety Valves Tested, Blow-Off Cocks Inspected and Repaired, and Shop Air Reservoirs Tested, Washed and Repaired.

PREVENTION OF PITTING IN LOCOMOTIVE BOILERS.

The Long Island, which has a total of about 200 locomotives, uses a water containing only about 5 grains of scale-forming salts per gallon. It is possible to use a set of tubes four years without removal—other conditions not interfering. The New York State law makes the cleaning of locomotive boiler tubes compulsory at least once every three years, so that the scale to be removed when overhauling a set of tubes runs light, usually from $\frac{3}{32}$-in. to $\frac{1}{16}$-in.

The Long Island water does, however, have properties which cause pitting, and the drawing shows a metal tube used in connection with the soda ash which is dissolved in the water to prevent this. These tubes are made in three lengths, 48 in., 58 in. and 78 in. The amount of soda ash used varies according to the class of locomotive and the service—passenger, freight or switching. The passenger service allowance is again dependent upon the mileage, either 100, 150, 200 or 250 miles, and varies from 1½ lbs. to 3¾ lbs. for one class of locomotive, and from 3 lbs. to 7½ lbs. for another class. The freight and switching service allowance is finally regulated according to hours run, either 12 or 24, and varies from a minimum of 1½ lbs. for a 12-hour run with one class of locomotive to a maximum of 8 lbs. for a 24-hour run for another class. The switching engines are all of one class and the soda ash allowance varies from 2 lbs. for 12 hours' service to 4 lbs. for 24 hours' service.

The drawing shows an opening in the bottom of the tube and a hood extending upward about 2 in. This hood provides a ¼-in. chamber around the tube, through which the water enters the bottom of the tube in the direction of the arrows. In this way the soda ash is dissolved slowly as the tube hangs in the water of the tank, the hook resting on the flange of the manhole. Near the top of the tube a 1-in. block figure is painted, showing its capacity.



Tube for Dissolving Soda Ash.

Shop Kinks.

FROM THE MORRIS PARK SHOPS OF THE LONG ISLAND RAILROAD.

BY F. E. LISTER,
Associate Editor, *Railway Age Gazette.*

In gathering kinks at the shops of the Long Island, the effort was necessarily confined to the locomotive department, since practically all of the car work is that which has to do with electrical equipment.

There are some 800 men employed at the shops, about 350 of whom are in the locomotive department, working 10-hour days. There are 188 locomotives to be cared for, from 8 to 12 of which are in the shop at a time. A general overhauling usually takes from 16 to 21 days.

Some of the kinks which are described were made from ideas obtained from other shops, and no claim to originality is made in these cases. A number of them were, however, originated in these shops. Nor are they all given as being entirely new—for some closely resemble kinks previously shown in these columns—but only as representing efficient devices which have made for savings in shop work.

Both the photograph and drawing of the same kink are shown in a number of cases, it being realized that neither is entirely explanatory in itself.

G. C. Bishop is superintendent of motive power and E. H. Sweeley is general foreman of the locomotive department. To both of these, as well as the machine shop foreman, smith shop foreman C. A. Slinker, and boiler shop foreman Wm. Damon, we are greatly indebted for many courtesies and the necessary assistance in obtaining the information, drawings and photographs.

ECCENTRIC STRAP CHUCKS.

The details and also a working view of a chucking arrangement for machining cast steel eccentric straps on a boring mill are shown in Figs. 1 and 2. The Long Island uses a flangeless eccentric strap with an I-shape brass bearing liner. This liner is double-flanged, one side gripping the strap and the other overlapping the eccentric. The flanges on the strap side of the liner do not clamp it tightly, but just enough to hold it while handling. The ½-in. thick strap liners between the two halves extend beyond the cast-steel portion of the straps and hold the brass bearing liners from turning. The two holding pieces of the chucks, to which the halves of the strap are bolted through the 1⅛-in. holes, are made ½-in. thick to correspond to the standard liner used. The strap is held above the bed of the machine to permit facing off the under side without resetting. The driving clamp is fastened to the bed of the machine, as are the holding pieces, and grips the blade end of the strap by the two set-screws. All three pieces may be made of either wrought iron or soft steel. Straps are handled, floor-to-floor, with these chucks, including boring and facing to snap gages, in about one hour per strap.

CYLINDER HEAD DOGS.

The design and the application of a set of dogs used in machining cylinder heads on a boring mill are illustrated in Figs. 3 and 4. There are three such dogs in a set and they are

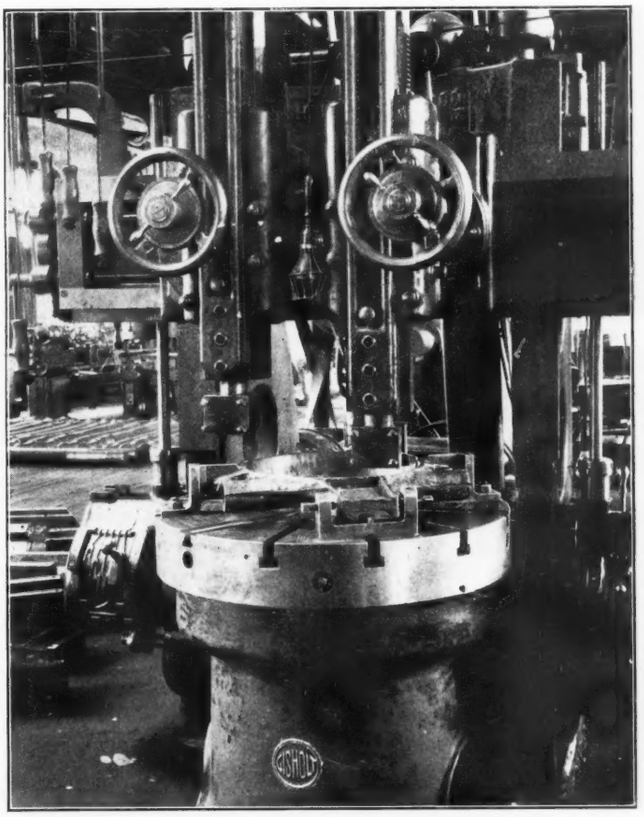


Fig. 2—Eccentric Strap Chuck as Used on Boring Mill.

made of soft steel. The gripping face, ⅞-in. in depth, has teeth, set at an angle of 60 deg. with the horizontal and opposed to the direction of motion of the machine, so that any tendency to slip forces the teeth more firmly into the work and wedges it more securely against the horizontal surface upon which it rests. Each dog has two holding bolts which tap into a cleat, fitting in the universal chuck strip in the machine bed. A sec-

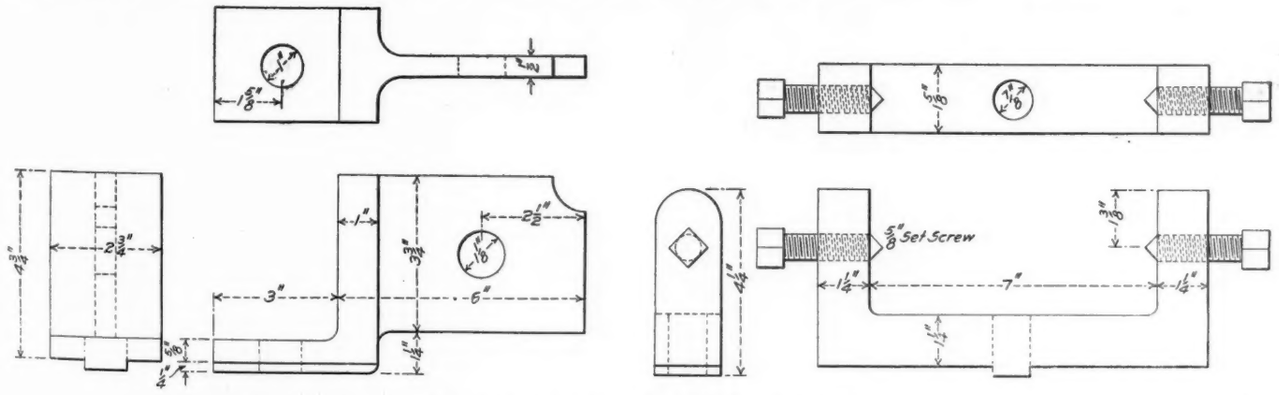


Fig. 1—Details of Eccentric Strap Chuck.

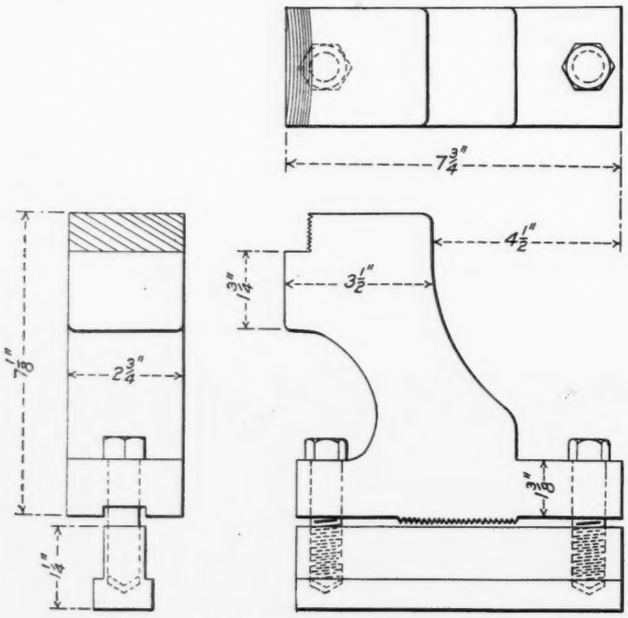


Fig. 3—Details of Cylinder Head Dogs.

tion of the base of the dog is supplied with teeth to mesh with those in the strips. These dogs are designed to take all of the cylinder heads used on the road. Although the chucks are used on a 42-in. high-power, double-head Gisholt mill, they give satisfactory results under the most severe conditions.

DRILL GUIDE.

A simple and efficient guide for use in drilling a series of holes which run into each other in the base of a rail is shown in Fig. 5. The guide was made especially for use in connection with cutting planer clearance slots in a number of standard section rails, the flanges of which were being planed down to permit their being used for guard rails. Although it is a special tool, it illustrates an application which may be used on any job requiring a series of consecutive drilled holes. A slight change in the design of the piece which holds the hardened bushing would be necessary for any work other than a rail.

The guide is held in place on the rail by driving in the wedge which draws the loose key against the flange. This idea is one which is used very extensively at the Long Island shops, on all sorts of jigs and chucks. It replaces the nut which is usual in such cases, being much more quickly operated. The body of the device is made of wrought iron or soft steel and the drill bushing of hardened steel.

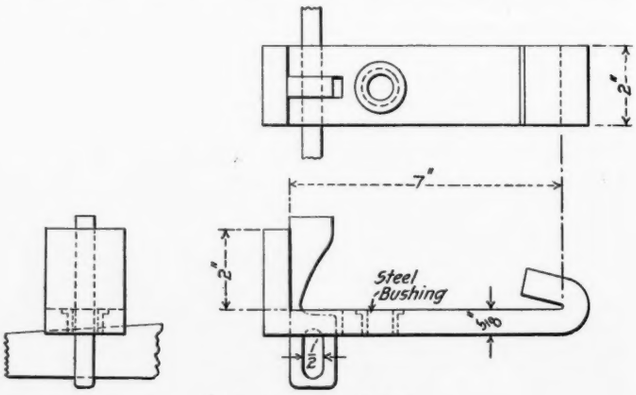


Fig. 5—Drill Guide.

TIRE BORING CHUCKS.

One of a set of three chucking clamps which are used when boring tires and cutting retaining plate surfaces, at one chucking, on a 42-in. Gisholt boring mill, are shown in Fig. 6. A set of these dogs in use is illustrated in Fig. 7. The chucks are fastened to the bed of the mill by two bolts each, which

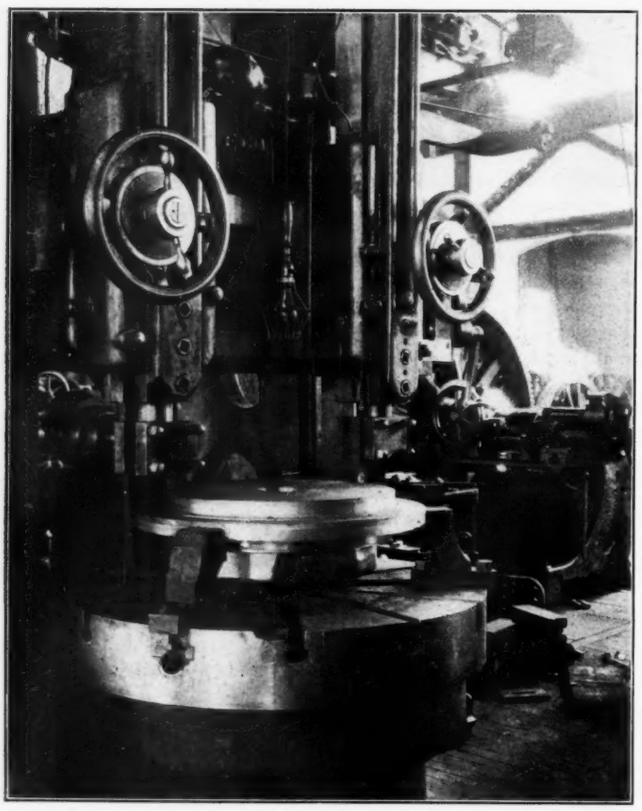


Fig. 4—Application of Cylinder Head Dogs to a Boring Mill.

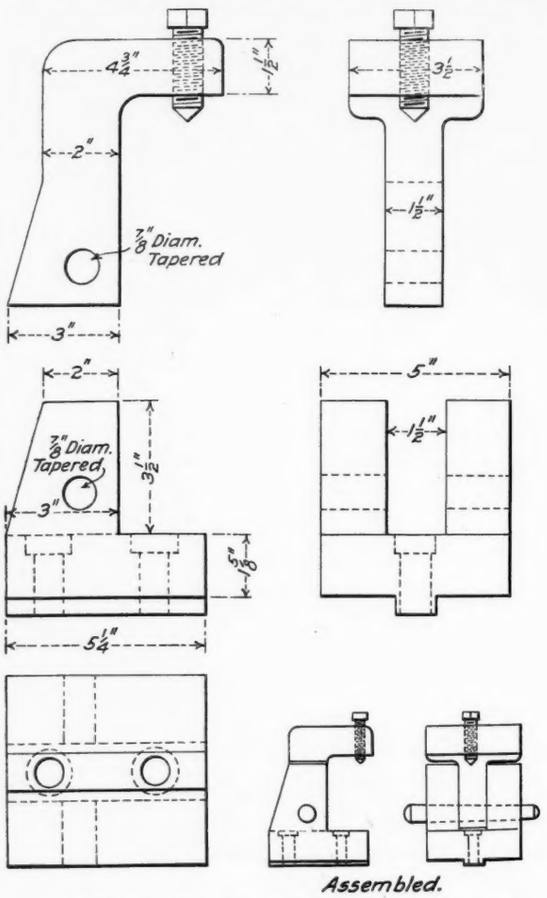


Fig. 6—Details of Tire Boring Chuck.

tap into strips fitting in the slots of the mill bed. The upper portions of the chucks fit snugly in the slots of the lower portions, and are held by large taper pins. When placing a tire on the machine the taper pins are driven out and the upper pieces removed. The tire rests on the horizontal portion of the base piece, and is adjusted to position by the horizontal set screws, which, in connection with the vertical ones in the top pieces of the chucks, hold it in place. These chucks are

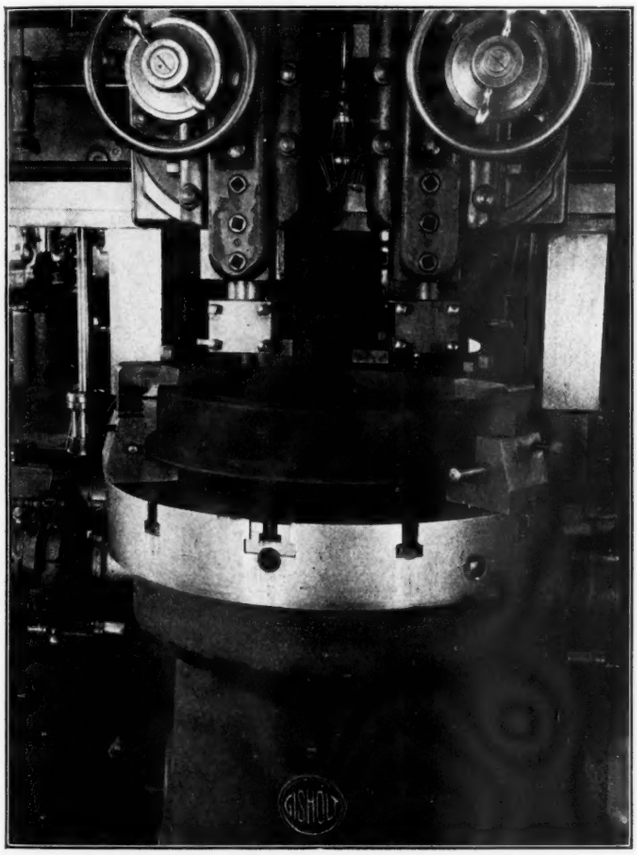


Fig. 7—Tire Boring Chucks as Used on Boring Mill.

made of axle steel and have been found very efficient, making rapid placing and removing of tires possible. It is this part of handling work on machine tools that is now receiving particular attention, as the probable limit of tool speed and depth of cut has been reached. The tire is bored and the retaining plate surfaces cut at one setting.

DRIVING BOX CHUCKS.

One of a set of two chucks used on a boring mill for facing off cast brass hub liners of driving boxes is shown in Fig. 8,

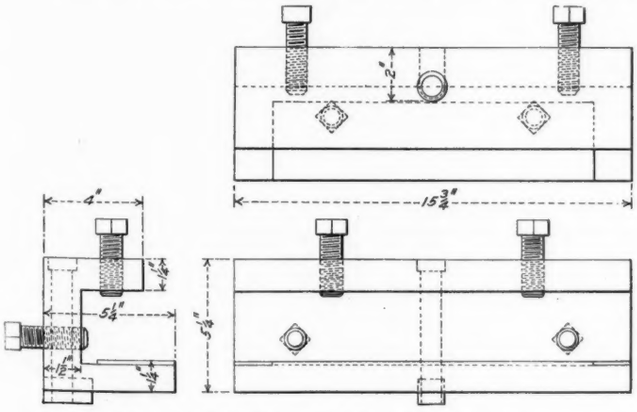


Fig. 8—Details of Driving Box Chuck.

while the photograph, Fig. 9, shows a pair of these chucks in use. They are fastened to the machine bed by bolts which pass down through the vertical portion of the chuck. These bolts have T-heads which fit in the slots. There is a 1-in. x 1-in. wrought iron piece, set in the bottom of the chuck, which meshes with the table slot and prevents rotation of the chuck. The chucks are fastened to the bed of the machine so that a box will slip into position easily, after which the set screws are tightened against the flanges. When the box is to be removed, set screws are loosened on but one side. These chucks will take all designs of boxes used on the road and are made of wrought iron, planed from the solid. A box is usually handled, floor to floor, in 15 minutes. Close inspection of the drawings will show

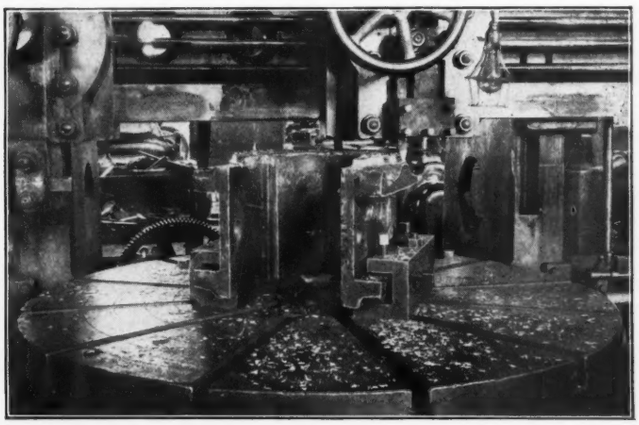


Fig. 9—Driving Box Chucks as Used on Boring Mill.

that clearance is provided to prevent burring the edges of a box when placed in the chucks.

TRUCK BOX CHUCKS.

One of a set of two angle plate chucks for holding truck boxes on a boring mill while machining hub faces which have been replaced with cast brass hub plates is shown in Fig. 10. The angles, or chuck plates, are made of cast iron, with the soft steel strip, 1⅛ x 2½ x 12½-in., set in ¼-in. on the vertical face. The plates are bolted to the boring mill bed by the ⅝-in. through bolt and also by two short bolts through the oblong slots in the base. The under sides of the upper flanges of the truck box rest upon the soft steel strips, and the box is held firmly by four ⅝-in. set screws, two in each chuck plate. This provides for the hub face of the box being parallel with the inner faces of one set of flanges. As there is usually considerable lateral motion of the box on the pedestal jaw, the inside flange surface need not necessarily be parallel with the jaw face.

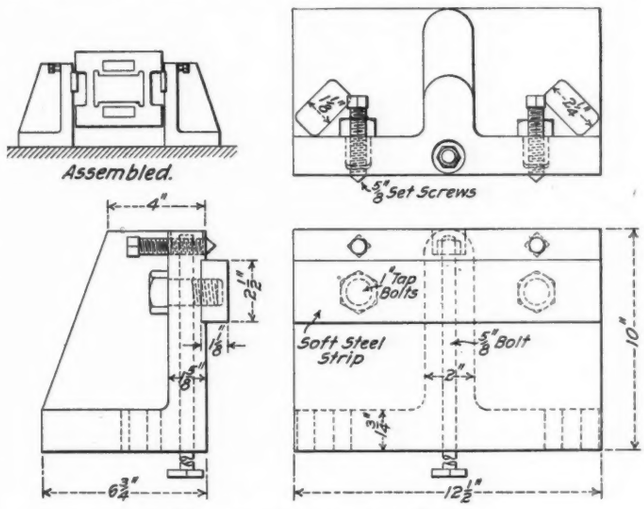


Fig. 10—Truck Box Chuck.

SHOE AND WEDGE CHUCK.

A chuck for planing shoes and wedges to the pop marks is shown in Fig. 11. It has a longitudinal strip cast on the bottom which fits the slot of the planer bed, and it is clamped down by two bolts which tap into a strip in the slot. The counterbored holes allow the bolt heads to be below the surface

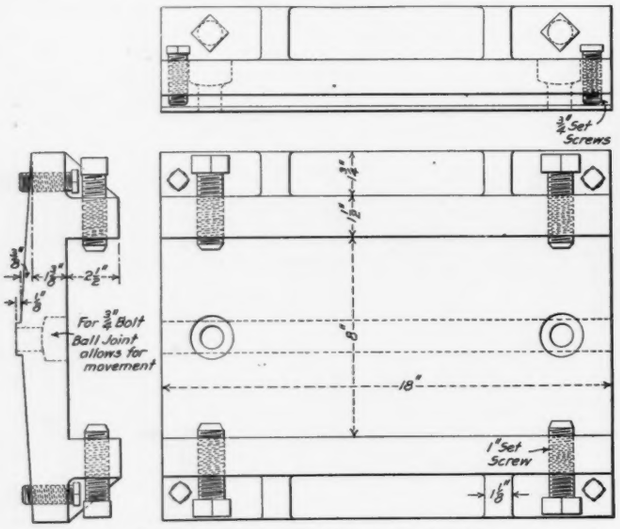


Fig. 11—Shoe and Wedge Chuck.

of the chuck, and as the bottom of the counterbore is ball-shaped, a tilting movement of the chuck is permitted. The shoe or wedge is placed in the chuck and the four 1-in. set screws set up lightly against it. The usual thin wedges are used under the flanges of the casting to bring the two pop marks on the outside flange up to the surface gage. When these points are correctly located, the four set screws are set up firmly and then the chuck itself is adjusted to bring the third pop mark to the same height as the other two. This adjustment of the chuck is accomplished by the four ¾-in. set screws, one at each corner of the chuck, which bear against the bed of the planer.

EXPANSION CHUCK.

A large saving in brake equipment maintenance is effected by bushing the hole in the top of engineer's brake valve top cases, through which the rotary valve key passes. This hole becomes worn, allowing the key to rattle and air to escape at the key washer. Unless this hole can be bushed the worn top case must be replaced by a new one. It is a simple matter to bore out the hole, bush it, and bore out the bushing to the required size, as the case can easily be fastened to the lathe face-plate. But facing off the inside end of the bushing, against which the washer bears, is difficult unless some sort of special

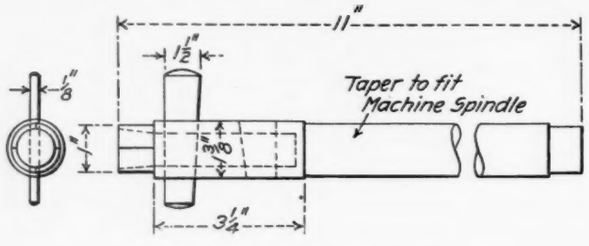


Fig. 12—Expansion Chuck.

chuck is employed. The one shown in the drawing, Fig. 12, is probably as simple, and at the same time as efficient a one as could be devised. Its application is shown in the photograph, Fig. 13. The taper fit of the chuck shank fits into the lathe spindle, while the opposite end fits the hole in the top case. The chucking end is sawed through up to the shoulder on two diam-

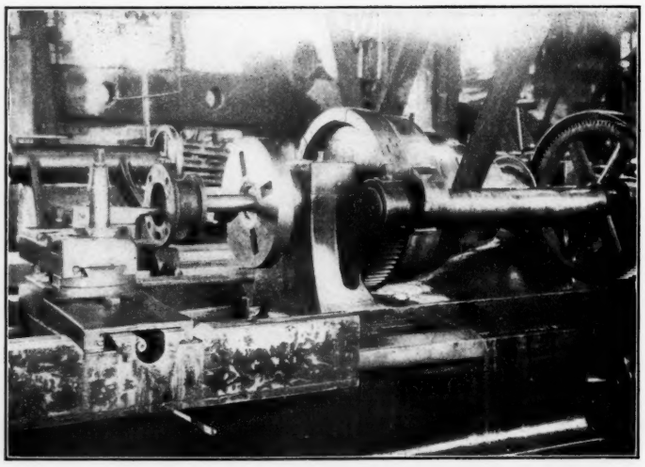


Fig. 13—Expansion Chuck as Used on a Lathe.

eters at right angles to each other. A conical wedge, with a straight shank which extends about 3 in. beyond the shoulder, is drawn into the split portion of the chuck, expanding it in the top case hole and gripping it firmly. The flat, tapered key is driven in one slot to spread the end of the chuck and in the other to close it again, the key, of course, passing through the straight shank of the conical wedge.

SLOTTER BAR.

A slotter bar, fitted with a clapper box which acts to relieve the tool during the return stroke, is shown in Fig. 14. The tool is held in the clapper by the two set screws which tap in from the bottom. Slots in the bottom of the bar provide for the movement of these screws. The coil spring, shown dotted, acts

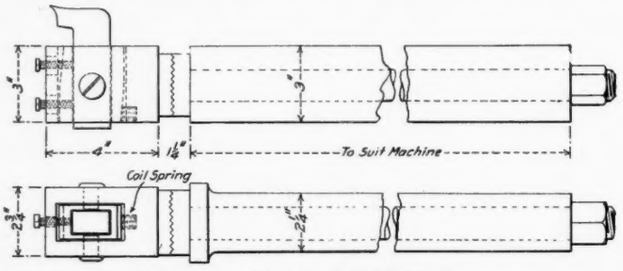


Fig. 14—Details of Slotter Bar.

to return the tool to the cutting position after it is free of the work and before the cutting stroke begins. Adjustment of the tool is also provided by loosening the nut at the top of the bar and revolving the end carrying the tool. This saves the work and the time required to readjust the bar on the machine head.

OLD TYPE CONTACT SHOE JIGS.

Three angle jigs used for holding an old type motor car contact shoe for drilling are shown in Fig. 15. As contact shoe parts are interchangeable, they are kept in stock in large quantities. The three jigs are placed on the multi-spindle press at the same time, so that one man can turn out 200 drilled contact shoe parts in a 10-hour day. The casting is machined on one face, and when placed in the jig this face provides for the setting. Provision for quick setting is made by clamping the casting against the jig and holding it by the wedge. This wedge is quickly placed and removed. Using three spindles and high-speed drills, the work is turned out rapidly.

JIGS FOR NEW TYPE CONTACT SHOES AND HOLDING KNUCKLES.

Two kinds of jigs, one for a new and smaller type contact shoe used on the new steel motor cars, and the other for the holding knuckle casting used with this shoe, are shown in Fig. 16. These castings also have planed surfaces, which set in the jig. The same method of holding, that of using wedges, is employed as in the above case.

SHAPER CHUCK FOR ROD BRASSES.

At the left of the photograph of the double-head shaper, Fig. 17, is shown a revolving chuck used for shaping rod brasses to size. The vertical faces are machined with a double cutter tool, the brass being revolved a quarter turn for each set of flanges and held in position by a pin stop. A second pin stop is arranged for less than quarter turns, such as for cutting the key taper faces on brasses which fit on square end rods. The brass is held against the angle plate by another flat plate, which is drawn up by the large nut. This jig has made it possible to do the work in one-quarter the time formerly required.

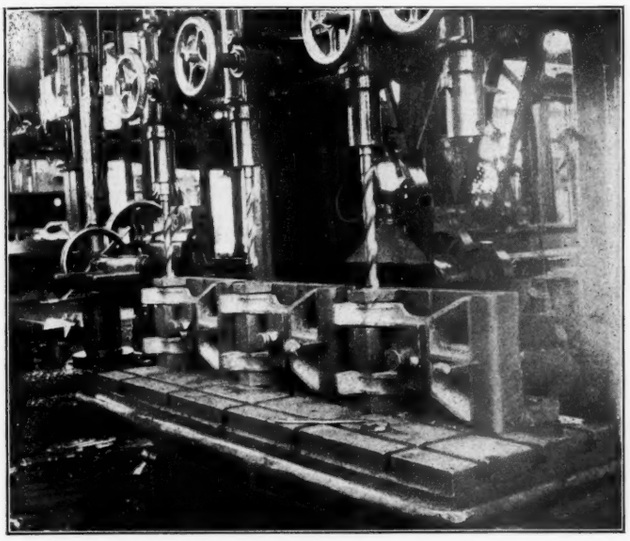


Fig. 15—Old Type Contact Shoe Jigs as Used on Drill Press.

As originally made, the entire chuck, shown at the right in the illustration, was of cast iron, but it would not stand the severe duty with high-speed steel. The old base is still in use, but the upper half and the sliding back were machined out of solid steel forgings. The adjustable foot rest is used to prevent any springing of the chuck when working on a long overhang job.

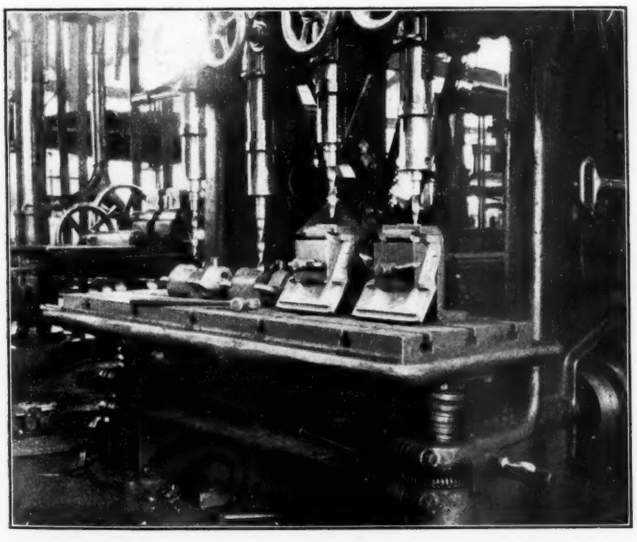


Fig. 16—New Type Contact Shoe and Knuckle Jigs as Used on Drill Press.

ECCENTRIC CAM CHUCK.

A cast iron chuck for boring and facing eccentric cams is shown in Fig. 18. Provision is made for 5-in., 5¼-in. and 5½-in. throw cams. When boring out cams that have been turned on the outside, circular filler pieces are used inside the chuck. When facing, the casting is held by the three 1-in. set screws, and when boring by three forged top clamps, fastened by 1-in. tap bolts. This work is done on the Grisholt boring mill illustrated in connection with the tire-boring chucks. About 1½ hours' time is required for the boring axle fit and facing both sides of a rough casting. For an old eccentric about 30 minutes' time is required for reboring.

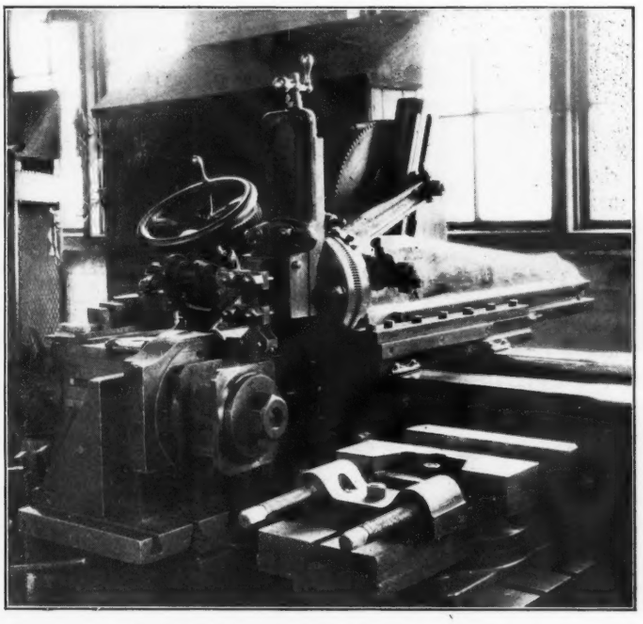


Fig. 17—Shaper Chuck for Rod Brasses.

PNEUMATIC STAYBOLT BREAKER.

The details of a pneumatic staybolt breaker are shown in Fig. 19. It is a rather highly-developed design, but does not differ in general from staybolt breakers previously shown in connection with shop kink articles. The cross section shows the

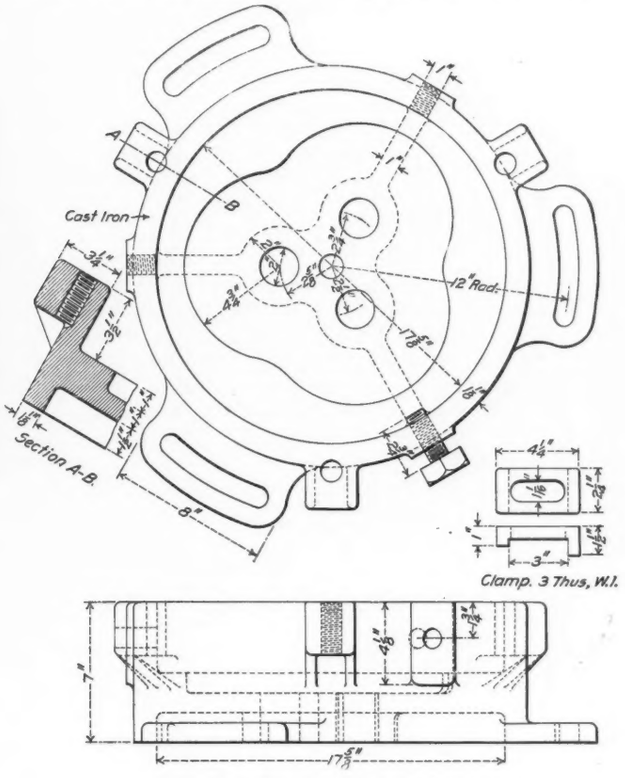


Fig. 18—Eccentric Cam Chuck.

arrangement of the live air and the exhaust valves, and the 16-in. x 3¼-in. diameter machinery steel ram, which has a packing ring at either end and a 2-in. x 4-in. piece of hard steel in the striking end. The ⅞-in. x 2⅜-in. x 14-ft. 3-in. long track on which the breaker runs is bolted fast to the firebox. One man operates the cam which locks the breaker in position, and also the air valve. A second man places the breaker bar end on the successive staybolts.

MANUFACTURE OF PISTON AND VALVE ROD PACKING.

When United States metallic packing was first introduced the rings were machined. Railway shops subsequently thought it practical to use cast rings in order to save the expense of the machine work, but in general it was found that serviceable packing could not be gotten in this way, as the metal would not flow sufficiently to fill the corners of the mold. Some success was attained, but it was confined to those shops where a non-shrinking metal could be made. When attention was directed to the subject of packing at the Long Island shops it was found that about all of the various types of United States metallic packing were in use, including a large number of sets of the single angle design. This design is especially difficult to maintain and does not give nearly as efficient service as the multi-angular design, especially if the latter is machined and its vibrating cups kept close to the piston rod diameter. The use of the multi-angular design of packing also permits making the soft metal rings of a lead base metal, which is much cheaper than tin base metal.

The four photographs given herewith show the three processes of making the soft metal rings and that of handling the vibrating cups. The rings are cut from a cast bushing, using a gang tool and cutting off one set of three rings at a time, as shown in Fig. 20. The bushings for piston rod packing are cast sufficiently long for cutting five sets of packing from each, while those for valve stem packing make six sets per bushing. The bushing is rough bored to a minimum rod diameter before the rings are cut. This rough size also suits the mandrel which is used in the second operation, that of forming. On top of the turret head is shown a number of cut rings, and on the pegs of the shelf above the machine are a number of sets of both cut rings and finished packing.

Fig. 21 illustrates the second operation, that of forming the outside of the rings to the exact contour of the vibrating cup. A set of formed rings is shown in place on the mandrel and the forming tool is shown turned up so as to better illustrate its shape. The rings are a neat fit on the mandrel, being held by the large nut and washer. After this second operation the rings are placed in stock in the storeroom, and the third operation, shown in Fig. 22, is performed where the packing is drawn for use. This last operation consists merely of boring the rings to the size for a particular rod. The set of rings is held in a bushing, of the same contour as a vibrating cup, by a chucking sleeve. One of these sleeves is also shown on the turret top. It has a heavy thread with three interruptions, which permits its being quickly placed in the chucking bushing, as but one-sixth of a turn is necessary to lock it. This bushing checks the finished size of the packing rings, since the rings will not properly fit in it unless they are made of the correct size. A number of sets of finished rings are shown in front of the turret.

The method of machining the vibrating cups for this packing is shown in Fig. 23. Close inspection of the photograph shows

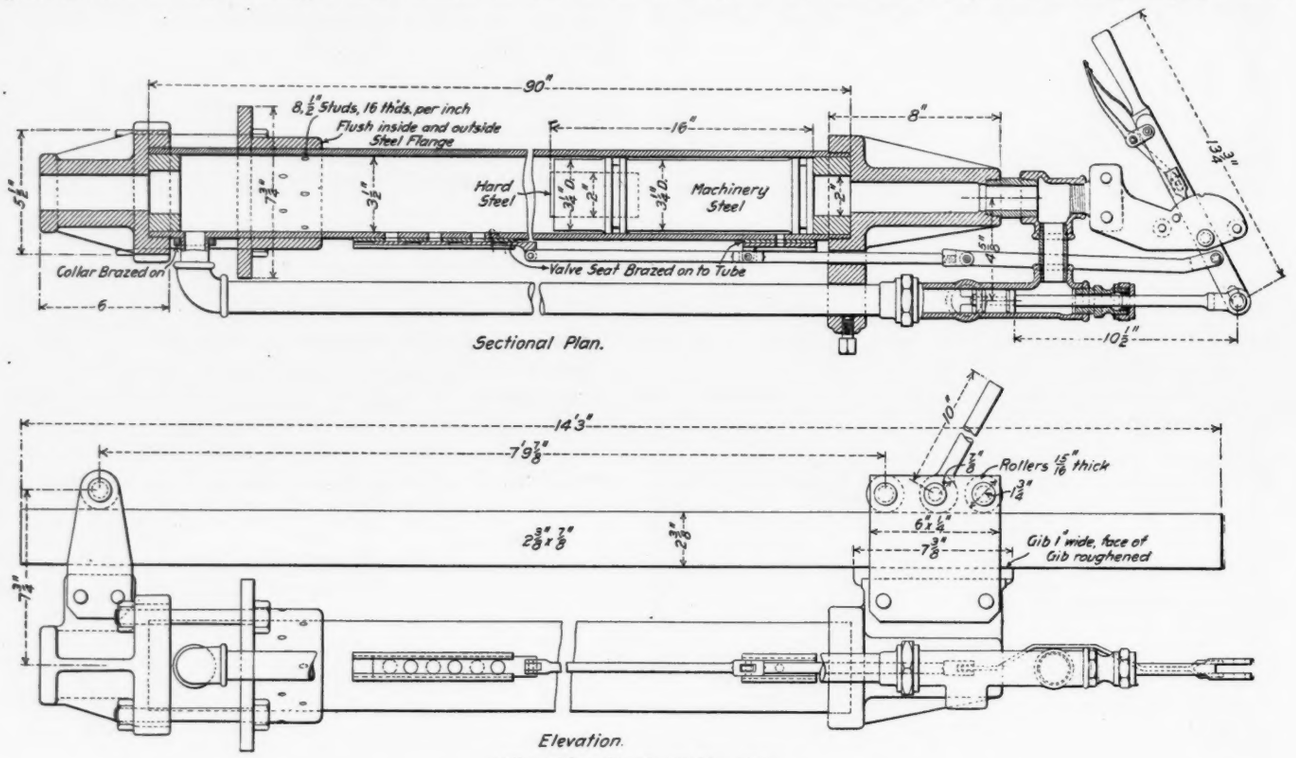


Fig. 19—Staybolt Breaker.

the two tools—roughing and finishing—which are used. These are forming tools, the roughing one doing most of the work and the finishing tool being used only for a light finishing cut to the exact contour of the rings. The rough casting is held in the universal chuck as shown. The outside is turned off and then the inside is formed. The cup is then reversed in the chuck, the straight face is finished and the rough metal remaining on the outside diameter is turned off. Vibrating cups are placed in stock and bored out to fit the rod when used.

The Gibbs pattern of vibrating cup is used on piston rods with enlarged crosshead fit ends, a built-up cup being necessary. The brass portion of the cup is cast in halves. These are faced for joining, doweled, sweat together, machined and afterward broken apart. The machine work is done on the same lathe and with the same tools and chucks as used for the packing.

APPLICATION OF A STEEL RIM TO A DRIVING WHEEL LATNE.

The Putnam wheel lathe, one face plate of which is seen at the right of the photograph, Fig. 24, was purchased before the advent of the present day high speed steel. The gears were cast on the face plates and the teeth have broken and cracked to

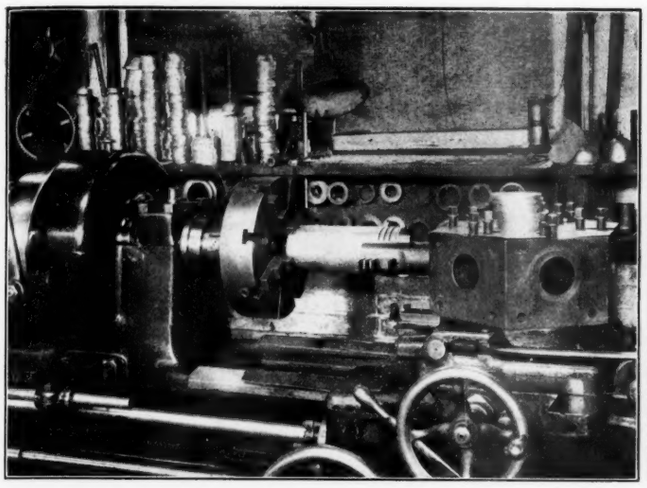


Fig. 20.

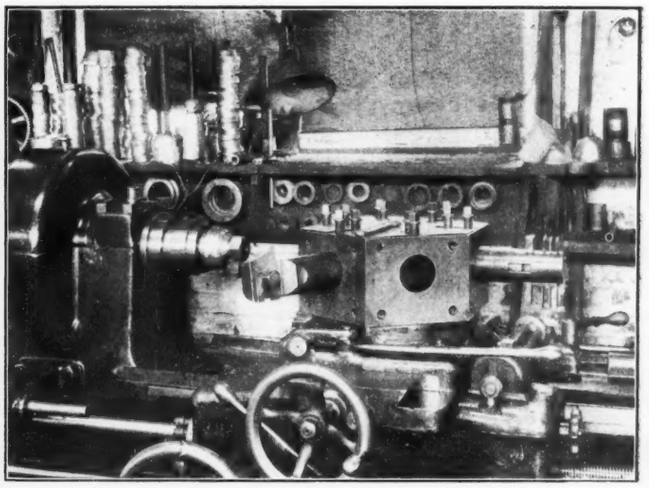


Fig. 21.

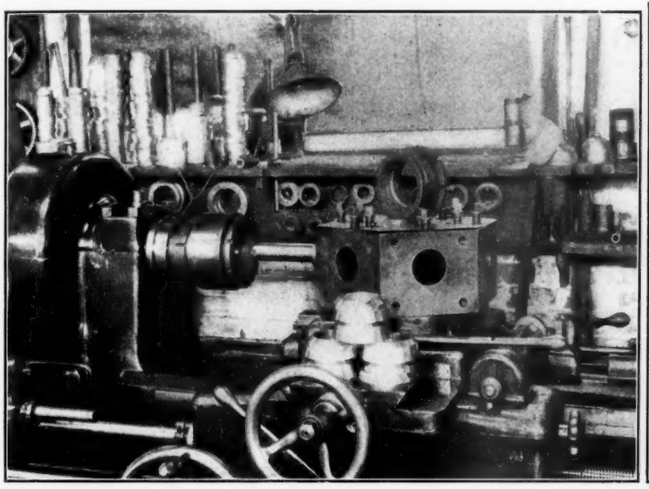


Fig. 22.

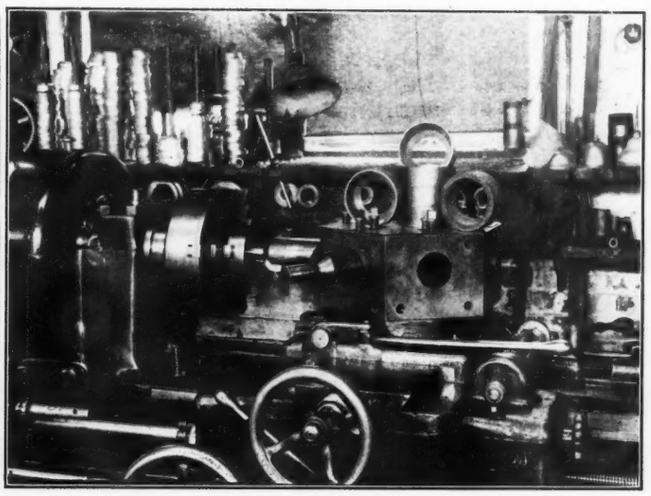


Fig. 23.

Manufacture of Piston and Valve Rod Packing.

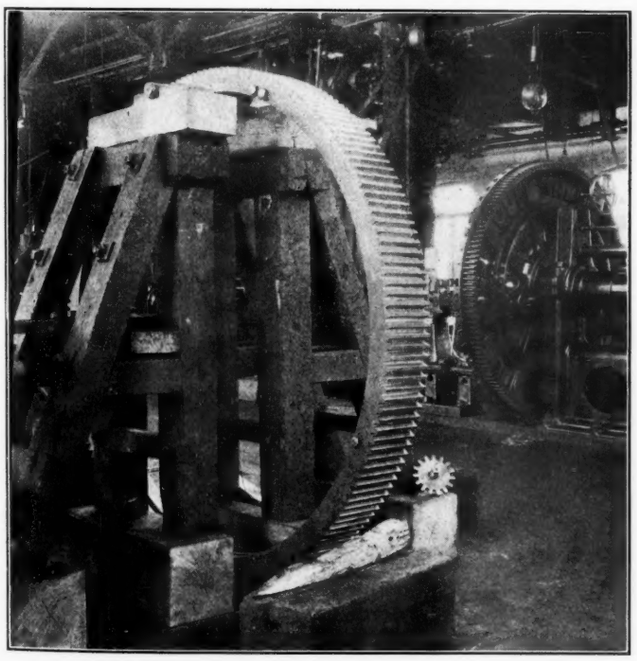


Fig. 24—Steel Gear Rims in Position for Filing and Lathe to Which They Will Be Applied.

such an extent, under the heavy duty to which the lathe has been subjected, that it was found necessary to get new face plates or put on new gear rims. The latter course was decided upon and in the foreground the two rims may be seen bolted together in the course of being finished. The old gear rims will be turned off on a 100-in. boring mill. A detail cross section of the new steel rims is shown in the drawing, Fig. 25, as is the method of fastening them to the face plate with 16, ⅞-in. tap bolts each. The application of these rims will not only completely redeem the lathe, but will make it serviceable for high speed steel duty.

Two special blank tires were made by a tire manufacturer. After being turned, bored and faced on the 100-in. mill, they were bolted together by drilling a few of the holes which will later be used for holding them to the plate. The 175 involute teeth, of 15-deg. obliquity and diametral pitch of 2, were laid off. A pop mark was made on the pitch line opposite each tooth. By bolting a crosspiece to the rim blanks and arranging a center, it was possible to cut the teeth on an 18-in. slotter. To provide for movement of the rims, front-end hopper castings were used. A permanent center point was arranged, which was let down into the pop mark on the pitch line when revolving the rim for each tooth. This acted as a check on the lines of the teeth. A square roughing tool was first used all around the gear, followed by a tooth-shaped tool. Snap gages checked the work while machining the teeth. The slotting operation was completed in about 100 hours. The photograph shows the two gears in position for filing the teeth to exact contour. The

small hand-cut pinion was made for a templet for filing. New steel cut pinions are being made by a tool builder for use with the new gear rims.

About two years ago new face plates were applied to this ma-

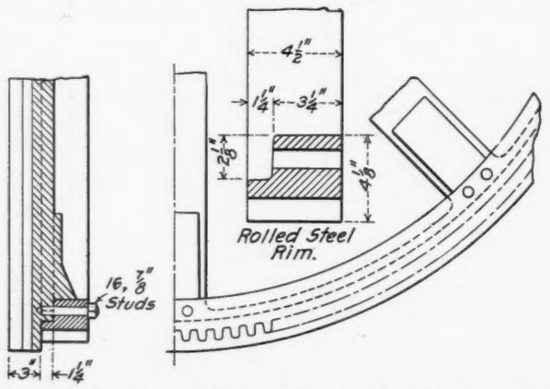


Fig. 25—Details of Driving Wheel Lathe Face Plate and Steel Gear Rim.

chine, but the cast gear rims failed. With the steel gear rims, it is expected that the machine will be useful for an indefinite period.

OIL TIRE HEATING.

The method of heating tires at the Long Island shops is illustrated in the photograph, Fig. 26. Wheels are handled to the stationary stand by the shop crane. This stand is made from an old axle, into which a cross frame brace is secured. The pipe which encircles the tire is perforated with ¼-in. holes. The cheapest grade of fuel oil is used with this heater. The oil is contained in the old air reservoir, and is forced to the jet by air pressure in the tank. The oil reaches the jet through a small pipe which is concentric with the one shown, the outer pipe carrying the air for mixture with the oil at the nozzle. The

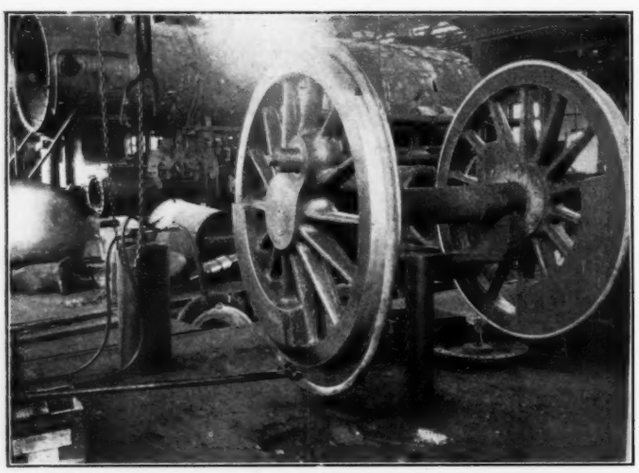


Fig. 26—Driving Wheels and Burner in Position for Heating.

oil is forced in both directions through the circular pipe and, by proper regulation and after the pipe has become heated, makes a steady blue flame all around the circumference of the tire. There is an open space of about 2 in. on each side of the T-end of the delivery pipe. This allows for syphoning outside air into the circular pipe. The tires are handled by the jaw clamps with a block and fall from a wall crane. It requires from 15 to 25 minutes to remove or replace a tire by this method of heating.

OIL CRUCIBLE FURNACE FOR MELTING BRASS.

An oil-burning crucible furnace for melting brass, for casting driving wheel hub liners, faces on driving and truck boxes, bushings for lift shaft bearings and rocker boxes, etc., is shown

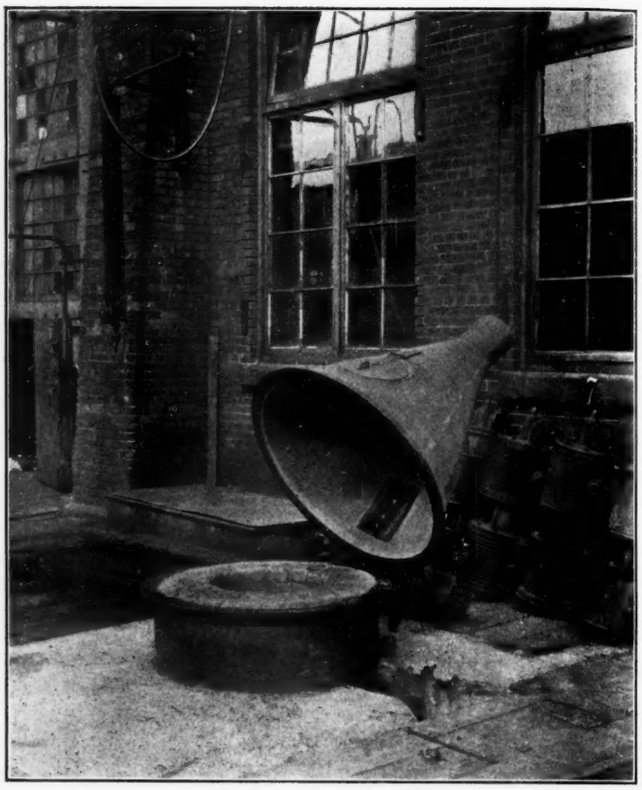


Fig. 27—Oil Crucible Furnace for Melting Brass.

in Figs. 27 and 28. The furnace proper is 40 in. in diameter, 36 in. high, and is set 18 in. below the ground level and in a concrete foundation. It is fire-brick lined and has a 9-in. x 9½-in. base in the center, upon which the crucible rests. The center line of the blast and oil piping is 10½ in. above the base of the furnace and about at mid-height of the base holding the crucible. The plan view in the drawing shows that the flame is directed into a space between the base and the brick lining, so that it takes a spiral course around the crucible. The furnace was designed along the general lines of a furnace seen during a visit to another shop, with one particular alteration, that of directing

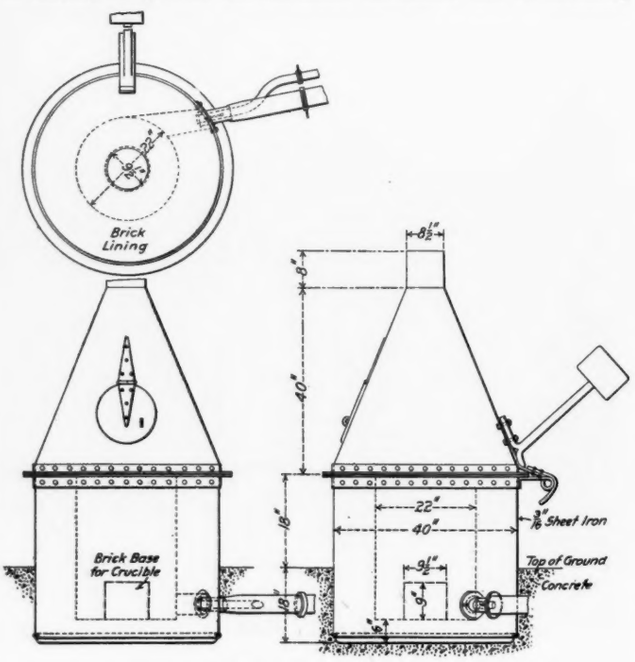


Fig. 28—Details of Oil Crucible Furnace.

the whole flame as shown in the drawing, rather than dividing and directing it squarely against the base of the cylindrical pillar.

A detail of the burner, which was designed by Mr. Sweeley, is shown in Fig. 29. The air blast, piped from the blacksmith shop, enters through the 1¾-in. pipe and also through the 3-in. gas pipe. The smaller pipe is held concentric with the 3-in. wrought iron pipe by three ⅜-in. set screws. Each of these pipes has an individual gate by which the air is regulated and a proper adjustment of these gives the required air supply. The oil supply is piped to the ⅜-in. copper pipe, and jetted through the ⅛-in. hole in the end of the copper pipe, against the ⅝-in. ball near the mouth of the 1¾-in. pipe, forming a spray. This acts to atomize the crude oil so that it mixes with the air blast.

When this furnace was first installed, it was found that the brass, after being cast for a hub liner, for instance, would crack, showing that the metal was being oxidized in the furnace. It was, naturally, the custom to regulate the oil and air supply

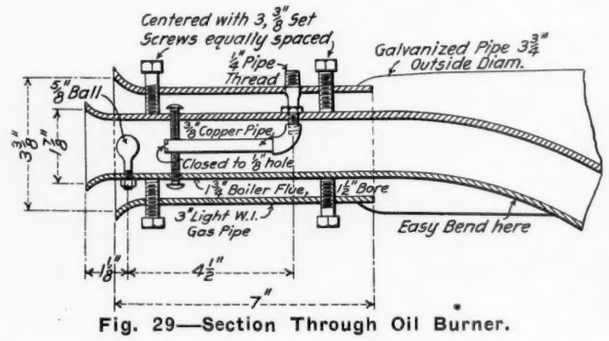


Fig. 29—Section Through Oil Burner.

to give a smokeless fire, but experiment with a slightly smoking fire gave a much better metal and one which would not crack when cold. The crucible will hold just enough metal to pour two hub liners at one heat. It requires 1½ hours to heat a charge from a cold crucible and 50 minutes from a hot crucible. When sufficiently heated, the top of the furnace is thrown back, as shown in the photograph; the crucible is lifted out with tongs and placed in a double handle loop, by which it is carried into the shop where the pouring is to be done. One of the cast brass hub liners is seen in place on the driving wheels shown in Fig. 26, and a cast driving box face being machined in Fig. 9.

AIR BRAKE ROOM.

A portion of the air brake repair room is shown in Fig. 30. Arrangements are now being made to move the air work to another portion of the shop, where about three times the floor space of the present room will be available. This fact, together with an appreciation of the close quarters of the present room, noticeable from the photograph, gives an idea of the possibilities of handling work in a small space when all of it is used to the best advantage. The all-metal stand in the center of the photograph illustrates the method used for overhauling steam and motor-driven air compressors, the ones shown being motor compressors. They are handled to the stands by an air hoist, cleaned, overhauled and tested without being moved. These stands have a pivot leg at one end and a roller leg at the other, which permits them being swung around, according to the work being performed. At the left of the illustration is shown the switchboard, through which current is received for testing the motor compressors. At the right are the locomotive air pump testing racks, with a metal pan for any waste water or oil.

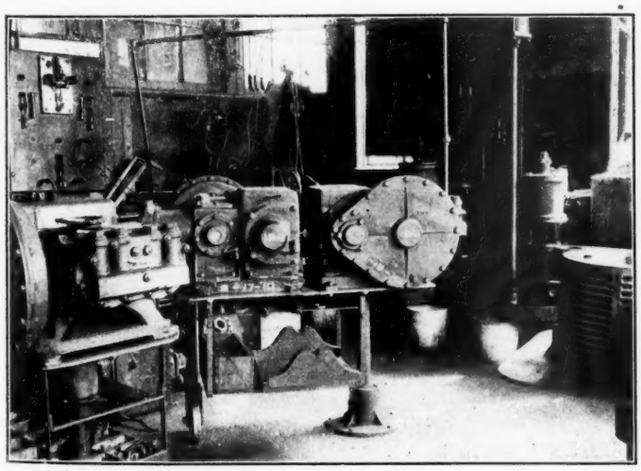


Fig. 30—Portion of Air Brake Room.

HANDLING FLUES.

The three photographs, Figs. 31, 32 and 33, were taken from the same position at the entrance door of the flue shop. By swinging the camera around it was possible to take in the three sides of the building, and to follow the direction of the flues

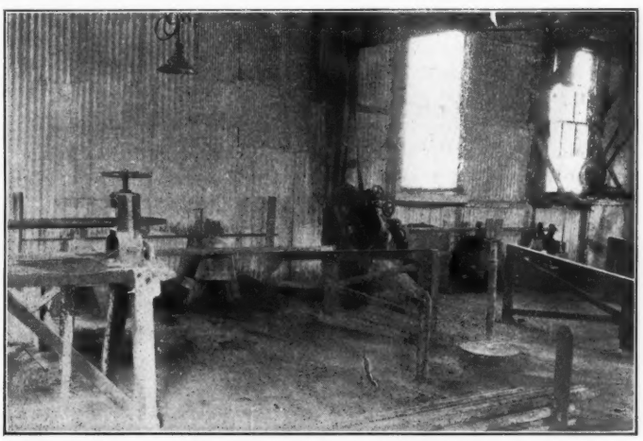


Fig. 31—Flue Shop. Cutting-Off and Cleaning Machines.

through the operations of their overhauling. The building, 50 ft. x 65 ft., with cement floor, stands some 12 ft. from the boiler shop end of the main building, from which the flues are brought by hand car over the rails of a pit track which extends into the flue shop. This arrangement affords a minimum of handling on the car, as a set of flues are carried to the flue shop pit track by the shop crane. In the center of the photograph, Fig. 32, is

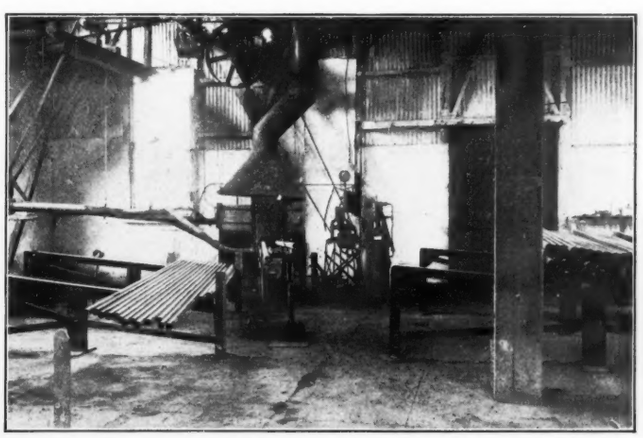


Fig. 32—Flue Shop. Furnace, Swedging and Welding Machines.

shown an Otto flue cleaning machine. This type of machine, when it was first introduced, replaced a large number of barrel flue rattlers, but has since been more or less generally discarded, it being thought that the toothed rolls were making the flues brittle. This matter, however, is not so considered at these shops, although only about 1/32-in. of scale is deposited on the flues between cleanings, so that the action of the rolls is not as heavy as would otherwise be the case. This method of cleaning

flues is also especially applicable at these shops, since there are but one, or possibly two, sets of flues on hand at a time. Were the rattler method of cleaning used, the time required for rattling would be lost, since no subsequent work on the flues could be done until they were taken from the rattler. As each flue must be handled separately after cleaning, it is no advantage to get a set at a time. With the roll cleaner, on the other hand, all of the work proceeds simultaneously, the cleaner supplying clean flues as fast as they can be handled through the other work.

The present arrangement of tools, etc., and of handling the flues through the shop was the result of an intention to thoroughly modernize the work. In attaining this end, the best practices in a large number of other shops which were visited were incorporated. All of the appliances for doing the work, with the exception of the cleaning and the swedging machine, were made at the Long Island shops.

With the former arrangement, an old flue welding outfit used a coal fire for heating. Seven men were required to handle the work, while with the present arrangement but three are needed and the flue shop is busy only about half time. The first man handles the flues from the car to the cutting-off machine shown at the extreme left of Fig. 31. After the ragged end is cut off

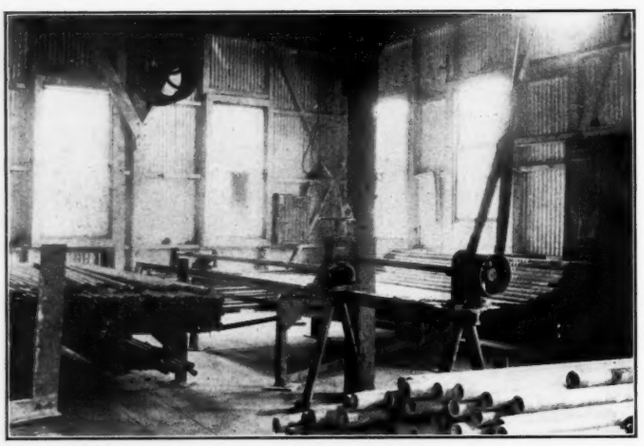


Fig. 33—Flue Shop. Machine on Which Flues Are Cut to Length.

the flue rolls down the incline into position for the cleaning machine. The same man has charge of the machine, and while a flue is passing through it, he is cutting off the ragged ends of others. After leaving the machine, the flue is placed on the incline at the right of the photograph, on which it rolls into position for the second man, who does the furnace, welding and swedging work.

Fig. 32 shows the furnace, welding and swedging machines, and the opening-up and safe-end racks, set on an arc, at the center of which stand the jacks which hold the ends of the flues. The left-hand hole of the furnace provides for the heating of the flue, after which the end is opened up and the safe end driven to position, as indicated in the drawings, Figs. 34 and 35. It will be noticed that the rack for the safe ends and the die for opening up the flue leans backward. This brings it at right angles to the flue, the end of which rests on the jack.

After the safe end is placed on the flue it is put in the right-hand hole of the furnace, and another flue is brought into the left-hand hole for the first heat. During heating for the weld the operator strikes the end of the flue against a plate in the back of the furnace, which acts as a guide in getting the flue in the exact path of the flame and also in increasing, to about ⅜-in., the length of the weld. This second heat provides for both welding and swedging. The welding machine has three rolls and a mandrel, and is operated by a foot lever, which also opens the air valve, so that the operator may have both hands to turn the flue. The weld is then scraped in the semi-circular knife just to the right of the welding machine, after which it is swedged. The McGrath type of swedger, made by the Draper Manufacturing Company, Port Huron, Mich., is used. Air jets remove the scale during welding and swedging, and the pipe leading down in front of the furnace provides a blast which directs the flames from the furnace upward and into the stack, or the flue would heat so that it could not be easily handled. The third man handles the work of cutting the flues to length. As he is

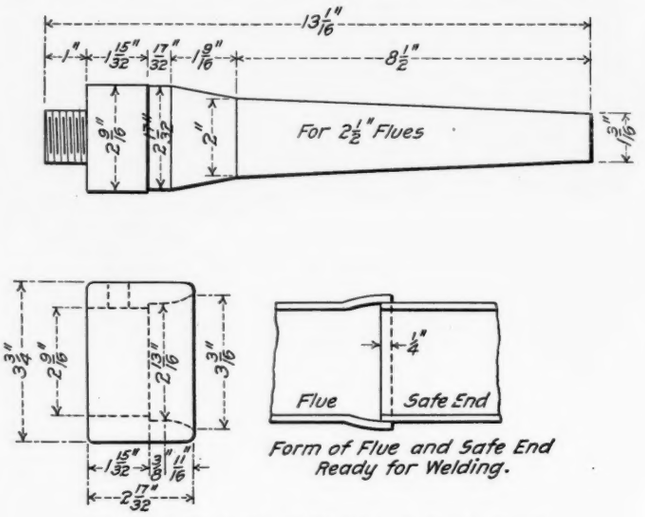


Fig. 34—Details of Weld and Tools Used.

the only man who goes to the boiler, he is responsible also for the swedging dies used. After the flues are cut off to length, they roll down the last incline, from which they must be again handled to the car on the track leading back to the erecting shop.

A flue-testing device is to be fastened to the legs of the cutting-off machine (Fig. 33), for testing the flues, immersed in water

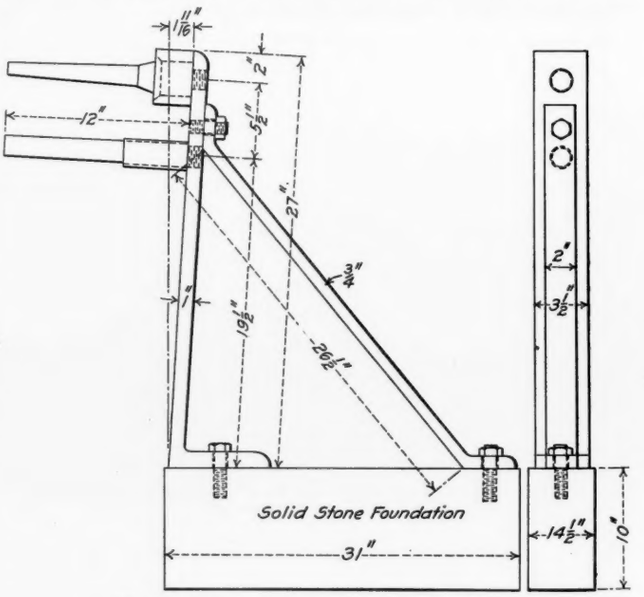


Fig. 35—Rack for Safe End Welding.

in a long pan, by air pressure. The flue work is under the jurisdiction of the boiler shop foreman. The average number of flues handled through this shop is 300 per day.

FORGING DIES.

A number of forgings made on a 2½-in. Ajax forging machine are shown in Fig. 36. In the smith shop the output has been greatly increased by making dies for doing a large amount of work which was formerly hand forged. Beginning at the left

of the photograph, the following forgings are shown: Freight car grab iron, U-shaped brake beam hanger, cylinder cock in two pieces, eye bolt, insulating pin, grate shaker, bar end, brake

Fig. 36—Machine Forgings.

jaw, grease cup, flexible staybolt, sleeve cap, patch bolt, collar eye bolt, safety hook, pilot brace foot, wrist pin nut, safety chain hanger, passenger car brake beam hanger and trunion bar head. The more interesting and representative forgings of these are shown, with their dies, in the illustrations which follow.

INSULATING PIN DIES.

A pair of dies for making insulator pins, used on the high tension lines of the electric zone of the Long Island, is shown at the left in Fig. 37. The porcelain insulators are cemented to the end of the pin, the corrugations providing a permanent bond. The stock, ¾-in. round, is first upset in either the upper or lower impressions, then reheated and the corrugations formed in the center impressions. The finished pin in place illustrates this operation. In making these pins five pieces of stock are placed in the furnace at a time. Each is upset and returned to the furnace, after which they are forged to shape. Previous to making the dies, these pins were made by having a cast iron threaded bushing instead of the upset end. They can be made on the forging machine at less than half of the cost by the former method.

CYLINDER COCK TOP PIECE.

The dies, plungers, etc., for making top pieces of locomotive cylinder cocks are shown at the right in Fig. 37. The stock, 1¼-in. round iron, is first upset, using the lower impressions and the right-hand plunger; it is then moved to the top impressions, where the hole is punched with the left-hand plunger. Cylinder cock lower pieces are also made on this forging machine, and a great saving results, not alone in that iron is cheaper than brass, but since there is not the loss by stealing, as is the case with the brass ones.

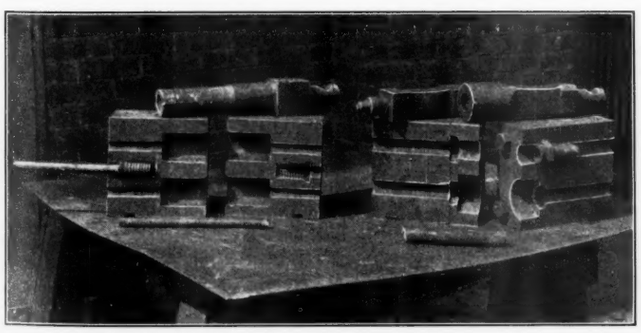


Fig. 37—Insulator Pin and Cylinder Cock Top Piece Dies.

SAFETY CHAIN HANGER.

A pair of dies used in making safety chain hangers for passenger cars is shown at the left in Fig. 38. A finished hanger is also shown. The stock, ¾-in. x 2½-in., is first heated in a furnace and given the 90-deg. twist. After the second heat, the stock is upset and formed in the lower impressions, taking the position shown. This same heat is sufficient for the final operation, that of giving the circular form to the loop. A thin film of metal remains after this blow, which is afterward punched out with a pin.

FLEXIBLE STAYBOLT SLEEVE CAP.

A die for making caps for flexible staybolt sleeves is shown at the right in Fig. 38. This cap is made in one heat, from 2¼-in. diam. punchings of ¾-in. scrap. But one blow of the plunger is required, the stock being dropped in from the top

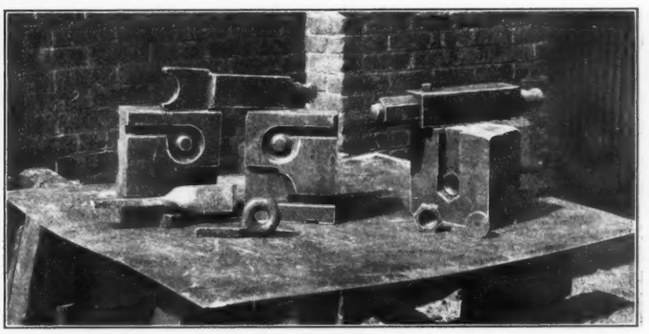


Fig. 38—Safety Chain Hanger and Flexible Staybolt Sleeve Cap Dies.

and the finished forging kicked out by a hammer blow on the ram seen at the back of the die. A man can make 800 of these caps per day of 10 hours.

BRAKE BEAM HANGER.

The left-hand dies shown in the photograph, Fig. 39, are used in making brake beam hangers for passenger cars. The stock, 1-in. round, is cut and bent to the shape shown as a bulldozer. After the second heat, the open end is placed between the dies and one end is formed and the weld, which falls in the center, is made. After a third heat the other end is shaped between the dies. About 25 of these hangers could be made in a day of 10 hours on an anvil, while by the above method 75 may be made in the same length of time.

U-SHAPED HANGER.

At the right of the photograph, Fig. 39, are shown two sets of dies for making a U-shaped hanger, used on the brake rigging of passenger cars. The piece of stock shown on top of the dies has been finally formed on one end in the large dies. The first

Fig. 39—Brake Beam and U-Shape Hanger Dies.

operation is that of bending, as shown at the opposite end. The S-shape is necessary in order to get sufficient metal into the dies to form the complete end, for which latter a second heat is required. This bending operation is done between the formers clamped on the top of the cast iron dies. A fifth heat is necessary for bending the hanger to the U-shape. The stock used is 1¼-in. round; about 80 complete hangers can be made in 10 hours.

COLLAR EYE BOLT.

The left-hand dies shown in Fig. 40 are used in making collar eye bolts for brake beam safety chains, a finished bolt and a

piece of bent stock being shown. The eye is bent on an eye-bending machine, and is reheated for final forming and welding between the dies. It will be noticed that each die is made in two

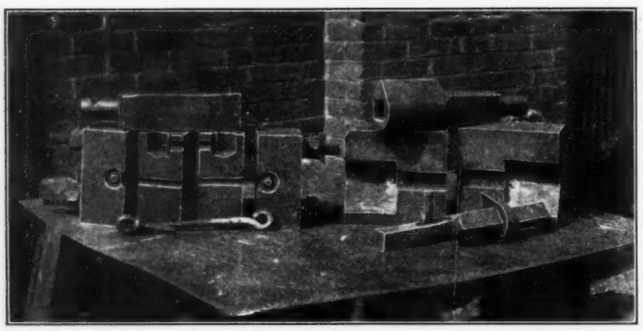


Fig. 40—Eye Bolt and Grate Bar Trunnion Head Dies.

pieces, joined by two 1-in. bolts and held apart about 2 in. by the two coil springs. When in the machine, the dies first close on the stock and then the plunger strikes the pair which grip the eye and force them against the other pair. The metal which bridges the space between the two sets of dies then forms the collar. The stock used is ⅝-in. round.

GRATE TRUNION BAR HEAD.

At the right in the photograph, Fig. 40, is shown a pair of dies used in forming a grate bar trunion head. This job requires 1⅝-in. square stock, which is first heated for receiving the 1¼-in. round pin. In the second operation the piece is completed.

ADJUSTABLE SCAFFOLD BRACKET.

A handy and quickly adjustable scaffold bracket in use in the car shops is shown in Fig. 41. The interesting part of this bracket is in the fact of its being counterbalanced by the swing weight and therefore being easily adjustable and self-fastening. The strips of ¾-in. x 4-in. iron are bolted to the post and held

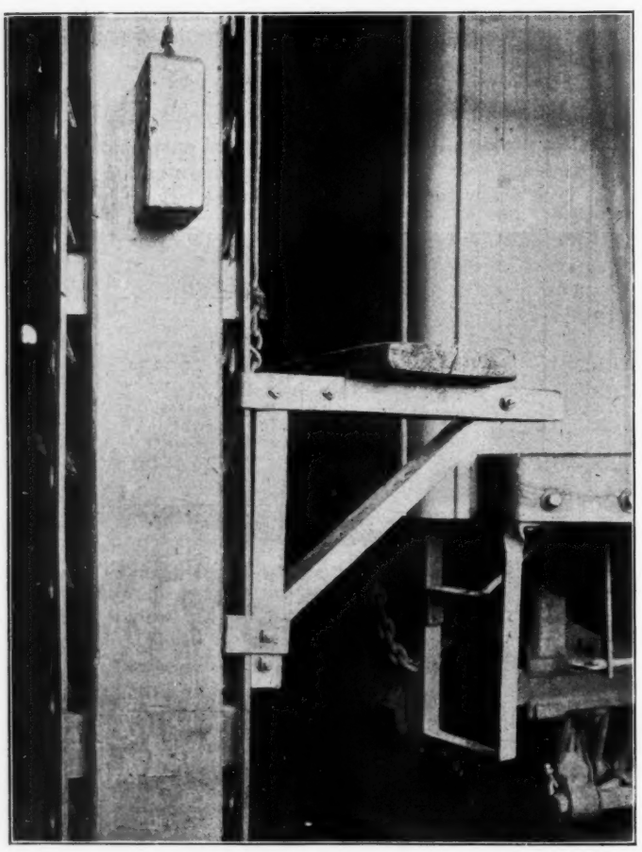
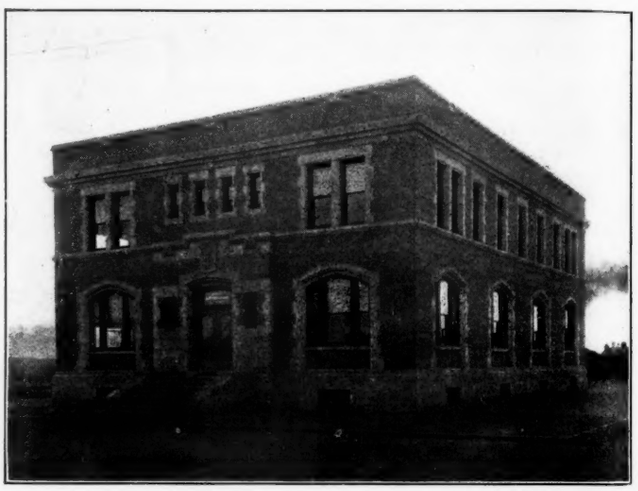


Fig. 41—Adjustable Scaffold Bracket.

a few inches from it by the filler pieces. Oblong holes are partly punched at intervals along these strips, and the metal is pushed back. This acts as a guide and pushes the holding pin, at the lower end of the bracket foot, out of the opening when the scaffold is to be moved upward. It is, therefore, only necessary to exert a slight pressure upward to raise the bracket and scaffold, as the counterbalance acts to lift the weight.

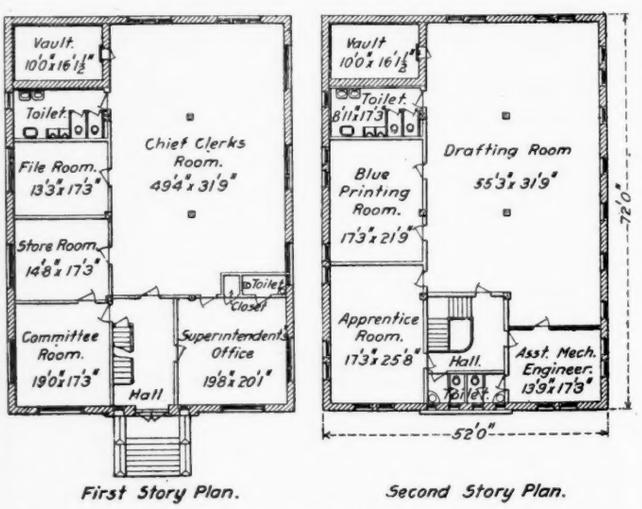
SHOP OFFICE OF THE ROCK ISLAND AT SILVIS.

The Rock Island has recently completed, at its main shop plant, Silvis, Ill., what is said to be one of the finest and best arranged railway shop office buildings in the country. The first



Office Building at the Silvis Shops.

floor will be occupied by the shop superintendent, G. W. Seidel, and his clerks, and the second floor by the mechanical draftsmen under charge of George S. Goodwin, recently appointed assistant mechanical engineer. The building is built of chocolate colored paving brick with Bedford stone trimmings. The interior is finished in substantial fireproof construction, the floors being cement. There are fireproof vaults on each floor, including the

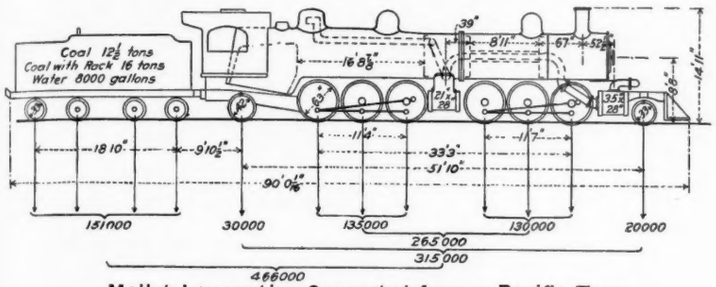


Arrangement of the Office Building at the Silvis Shops.

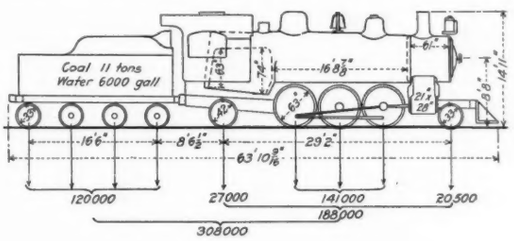
basement, the latter to be used for storage of office records. An important feature, the value and importance of which is becoming more and more generally recognized, but which has received little or no attention until comparatively recently, is the provision for an instruction room for apprentices—not a makeshift, pushed as far in the background as possible, but large, well lighted, comfortable quarters.

CONVERTED MALLET LOCOMOTIVES FOR THE CHICAGO GREAT WESTERN.

Extended experience in the conversion of simple locomotives into Mallet compounds has resulted in a reduction in the cost by utilizing more of the old material. A good example of this is seen in the three articulated locomotives which were converted from Prairie type locomotives by the Chicago Great Western at its Oelwein shops. The front units with the low pressure cylinders were purchased from the Baldwin Locomotive Works.

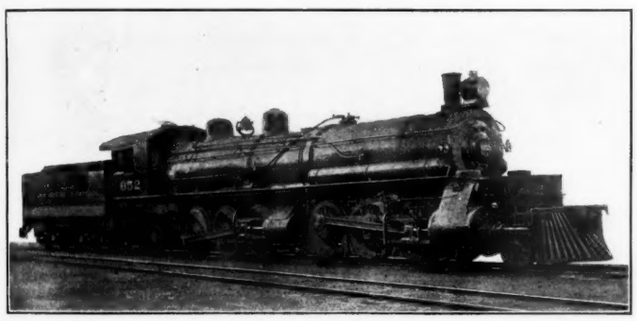


Mallet Locomotive Converted from a Pacific Type.



Pacific Type Locomotive Which Was Converted to a Mallet.

The maximum tractive effort of the engine was thus increased from 33,000 to 52,000 lbs., or 57.5 per cent. The steam generating portion of the old locomotive remains the same; that is, the firebox and boiler shell with the tubes remain as they were; the additional steam required for the larger engine will be obtained from the economy resulting from the compound cylinders and the large amount of heating surface provided in the feed water heater. It is claimed that converted Mallets on other roads are hauling 50 per cent. greater tonnage with the same amount of coal consumed by the old locomotives.



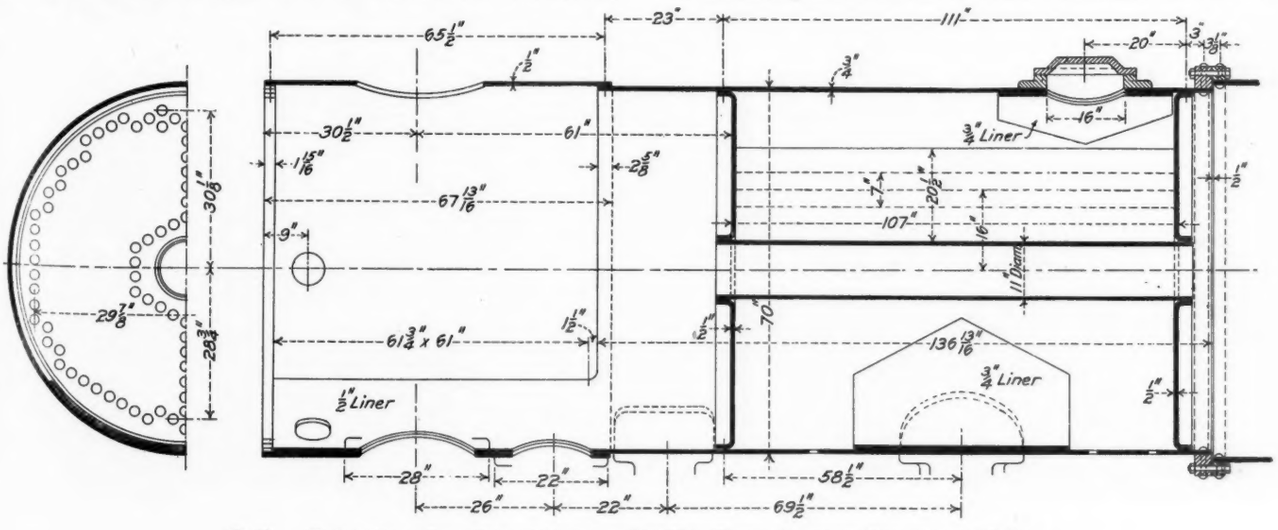
Mallet Locomotive Converted from a Prairie Type.

The principal dimensions of the Prairie type locomotive are shown on the small diagram and in the accompanying table. The cylinders were 21 x 28 in. and the heating surface of the tubes was 3,225 sq. ft. The feed water heater, which occupies all the water space in the shell of the new front unit, has 400 2-in. tubes and it is assumed that this is equivalent to an addition of 1,700 sq. ft. to the normal heating surface, making a total of 4,924 sq. ft. of tube heating surface, which, added to 154 sq. ft. in the firebox, gives a total of 5,078 sq. ft.

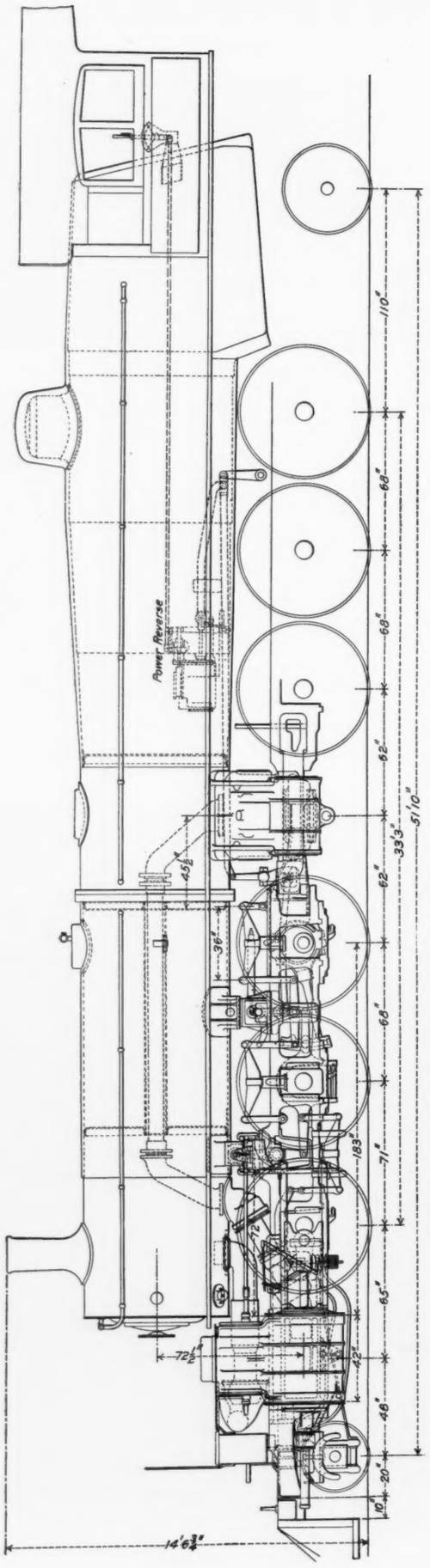
The driving wheels are 63 in. in diameter, and the new low-pressure cylinders are 35 x 28 in. The weight on the three pairs of old drivers has been reduced from 141,000 to 135,000 lbs., and the new front section has 130,000 lbs. on the drivers, making a total of 265,000 lbs. The total weight of the engine is 315,000 lbs. The principal dimensions of the Mallet locomotive, as converted, are shown on the small diagram, and the principal features of its construction are illustrated in the larger elevation. The table below gives the dimensions, weights and ratios of the old and new engines:

	Old Prairie type.	New Converted Mallet.
Heating surface, firebox	154.0 sq. ft.	154.0 sq. ft.
" " tubes	3,071.0 "	4,924.0 "
" " total	3,225.0 "	5,078.0 "
Grate area	49.3 "	49.3 "
Tubes, number and diameter	352, 2-in.	352, 2-in.; and 400, 2-in. F.W. heater.
Tubes, length	16 ft. 9¼ in.	16 ft. 8⅞ in., & 8 ft. 11 in.
Steam pressure	200 lbs.	200 lbs.
Valves	11 in. piston.	
Size driving journal, front & back	9 x 12 in.	9 x 12 in.
" " " main	9½ x 12 "	9½ x 12 "
" " " radial truck	7 x 12 "	7 x 12 "
" " " eng. truck.	6 x 12 "	6 x 12 "
" " " tender	5 x 9 "	5½ x 10 "
Total wheel base	54 ft. 2½ in.	80 ft. 6½ in.
Ratio, htg. surf. to grate area	65.4	65.4
Ratio, htg. surf. to cyl. volume	287.4	287.4
Total w't., eng. & tender, empty.	236,500 lbs.	367,500 lbs.
Total w't, eng. & tender, loaded.	308,500 lbs.	466,000 lbs.
Ratio of adhesion	4.23	5.1
Tractive effort	33,320 lbs.	52,100 lbs.
Trac. effort. per lb. M.E.P.	196	306

In converting the aim was to retain and utilize as much of

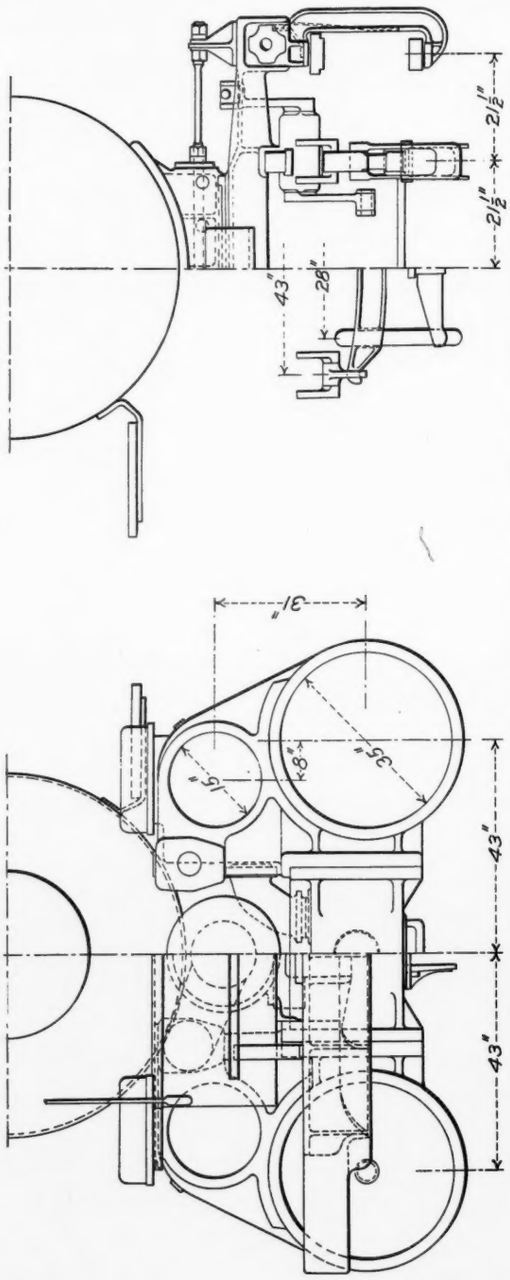


Boiler Extension for Converting a Pacific Type Locomotive to a Mallet.



Mallet Locomotive Showing in Detail That Part Which Was Added in Converting from a Pacific Type.

the old engine as possible, and the following parts were taken from the Prairie type engines and used on the front end of the Mallets: The pilot, engine truck and center pin, smokestack, blower pipe fittings, smokebox, air pump exhaust, fitting plug fixtures and headlight bracket. In addition to the new compound cylinders and the boiler shell with the feed water heater, the Baldwin Locomotive Works furnished the following: The lagging and jacket for the check pipes, a cover for the old stack base, steam power reverse rigging, cast iron diagonal steam pipes, reverse shaft, reverse lever rod, radius bar, cross-tie and brake fulcrum, transverse equalizing beam and link,



Sections Through Portion Which Was Added to Pacific Type Locomotive in Converting It to a Mallet.

engine truck, radius bar and brace, starting valve cock and handle. The Stephenson valve gear is retained on the new engine and a similar type of valve gear is used on the new front engine unit. The piston valves for the low-pressure cylinders are 15 in. in diameter. The connection of the old smokebox with the new boiler extension is made with a V-shaped joint secured by 36 1¼-in. bolts.

The feed water heater forms about one-half the new boiler shell, while the smokebox occupies the balance. It is filled with

400 2-in. tubes, 107 in. long over the tube sheets. The heads of the feed water heater are flanged out at the center for riveting in a flue 10 in. in diameter inside and ½ in. thick; through this passes the 8-in. steam pipe or receiver, taking the exhaust from the high to the low-pressure cylinders. The old exhaust base joint on the high pressure cylinder is covered by a diagonal pipe with a wide flange, and this carries the steam to a joint connected with the horizontal steam pipe at the center of the feed water heater; a similar joint and diagonal pipe at the front end conduct the steam to a large flexible joint outside the smokebox. This passage is continued by a slip joint section connected to another flexible joint, which forms a direct passage to the steam ports of the low-pressure cylinder. This large steam pipe in its whole length from the high-pressure cylinder has but a small portion exposed to the cold air, as the principal part of it is surrounded by the hot gases in the two smokeboxes or by hot surfaces, so there should be a smaller loss by condensation than in the ordinary design of Mallet locomotives, where the steam pipes are almost entirely outside. The steam pipe also forms a long receiver and acts as a reheater.

A rectangular sand box is placed over the front truck, and a ¼-in. compressed air pipe forces the sand under the front drivers. The sandbox on top of the boiler is retained with its fixtures for use on the drivers of the rear unit. The tender is entirely new; the tank has a capacity of 8,000 gal. of water, and there is space for 12½ tons of coal. By the use of coal racks the coal capacity may be increased to 16 tons. We are indebted to J. G. Neuffer, superintendent of motive power of the Chicago Great Western, for the drawings and data included in this article.

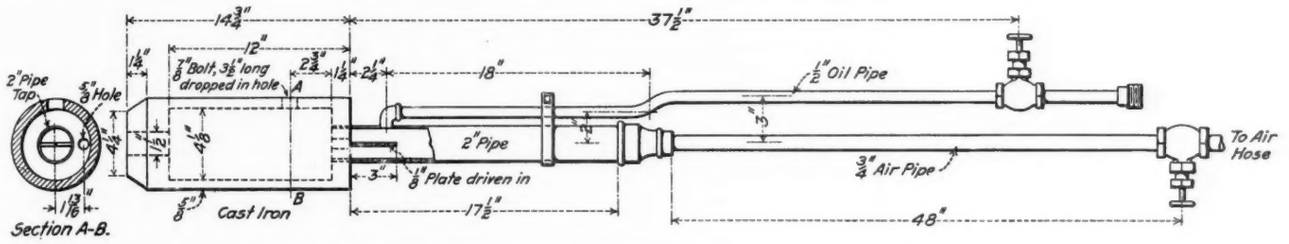
WELDING FRAMES AT THE WABASH SHOPS.

The photograph illustrates a recent job of frame welding at the Fort Wayne shop of the Wabash. This method of welding frames is in use at all the main shops on the Wabash system, in addition to being used in taking care of broken frames at roundhouses.

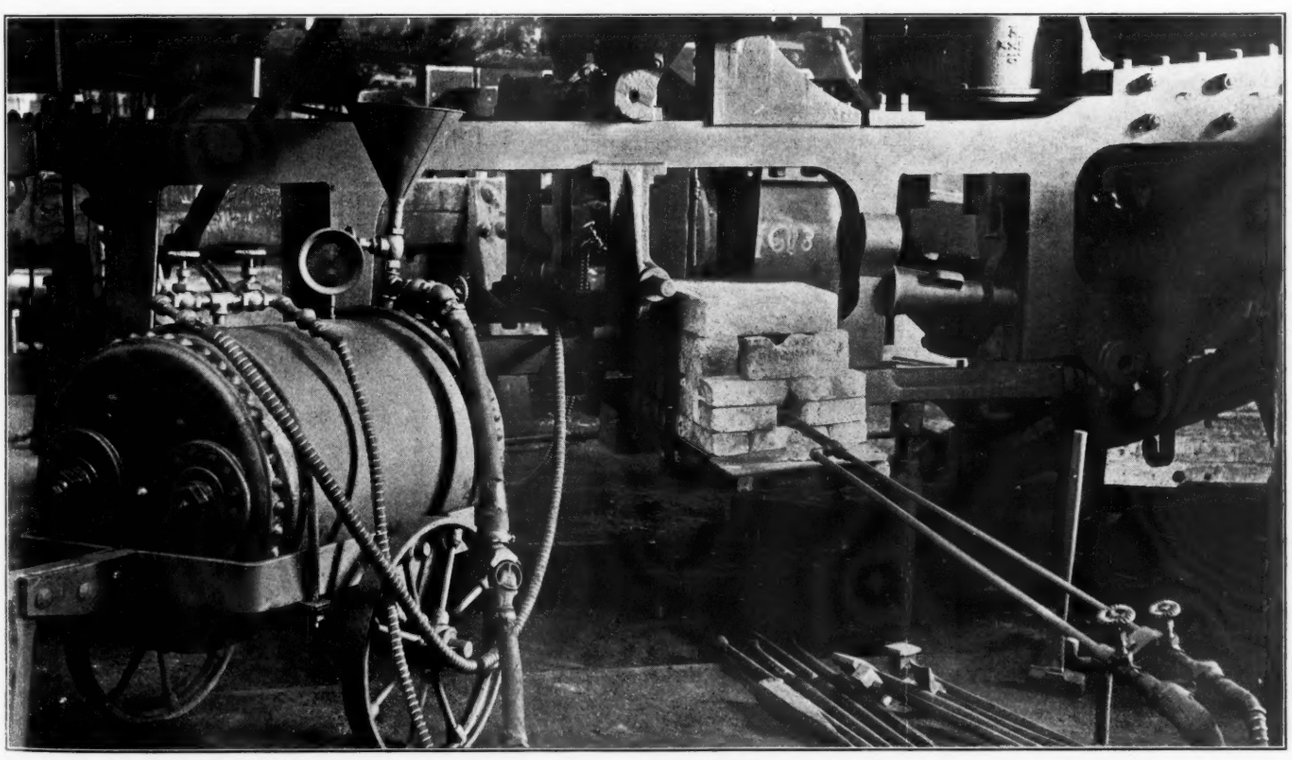
To weld the top or bottom rail of a frame without taking it down is not difficult and is quite frequently done by simply dropping one pair of wheels. In this case, however, practically an entire new leg was welded on, as shown, without taking the frame down. The piece forming the new leg was first forged and finished, then held in place by applying the pedestal binder and a jack between the jaws.

A home made crude oil burner, shown on the drawing, was used and the weld in the bottom rail was made first in order to take care of the longitudinal expansion. The photograph shows the manner in which the welds were made; the ends of the frame were tapered and the ends of the new jaw were made V shaped, with sufficient metal to form the weld.

The total expense was $57.43, including labor for forging and finishing the new pieces and the cost of the firebrick, clay and crude oil.



Crude Oil Burner Used for Welding Locomotive Frames at the Wabash Shops.



Welding a Frame with Crude Oil at the Fort Wayne Shops of the Wabash.

AIR-ELECTRIC HOIST IN THE LEHIGH VALLEY SHOPS AT SAYRE, PA.

BY H. G. BECKER,
Shop Demonstrator, Lehigh Valley, Sayre, Pa.

For use over the large flange fire in the boiler department, and swinging from one of the building columns, is a 25-ft. crane girder, from which is suspended a 6-ft. air hoist, for handling the various boiler sheets to be flanged. This air hoist operates satisfactorily on sheets that are only required to be raised from the fire and dropped upon the flanging form, but when flanging the upper half of a large throat sheet, it must be suspended and held in a vertical position, which necessitates one corner of the sheet being held 12 to 14 ft. from the floor. This is impossible with the use of the air hoist, as is clearly shown in Fig. 1. It was the custom to use the overhead traveling shop crane, which is in constant demand in the machine bay, to hold a throat sheet until the entire upper half could be flanged, which required from one to two days. The handicap in the machine boy due to the holding up of this crane may readily be realized, as the output of the shop depends upon prompt crane service.

To eliminate this trouble the electric hoist shown in Fig. 1 was designed. It consists of a drum, W, geared to a 5-h.p. electric motor, operated by the controller A, by which the load is raised or lowered by means of the ⅜-in. chain, one end of which is anchored at the extreme end of the girder, and passes back over the carriage pulleys X, X, and block Y, over pulley Z and down to drum W. The carriage is moved in or out on the girder by a ¼-in. chain connection with the reversible air motor B. This motor is geared to a pulley that carries the chain which is fastened to the carriage O, and passes over a pulley on the extreme end of the girder. A light chain is fastened to the reversing attachment on the motor and is dropped to a convenient height so that the operator may control the motor with his left hand, leaving the right one free to operate the controller A.

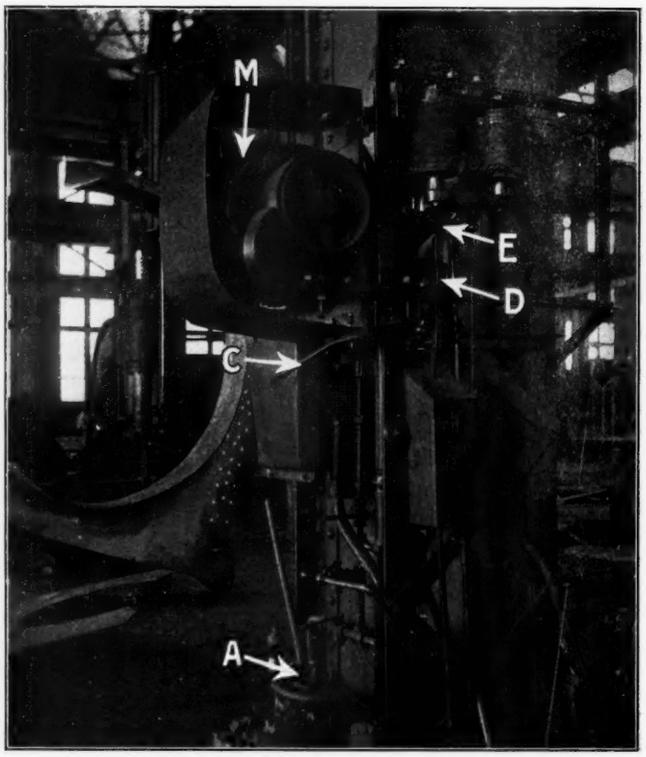


Fig. 2—Magnetic Brake for Electric Hoist.

In order that the load may be stopped and held at any desired height, a magnetic brake was devised, as shown in Fig. 2; this allows perfect control of the load at all times. The brake is applied instantly upon the current being shut off from the motor

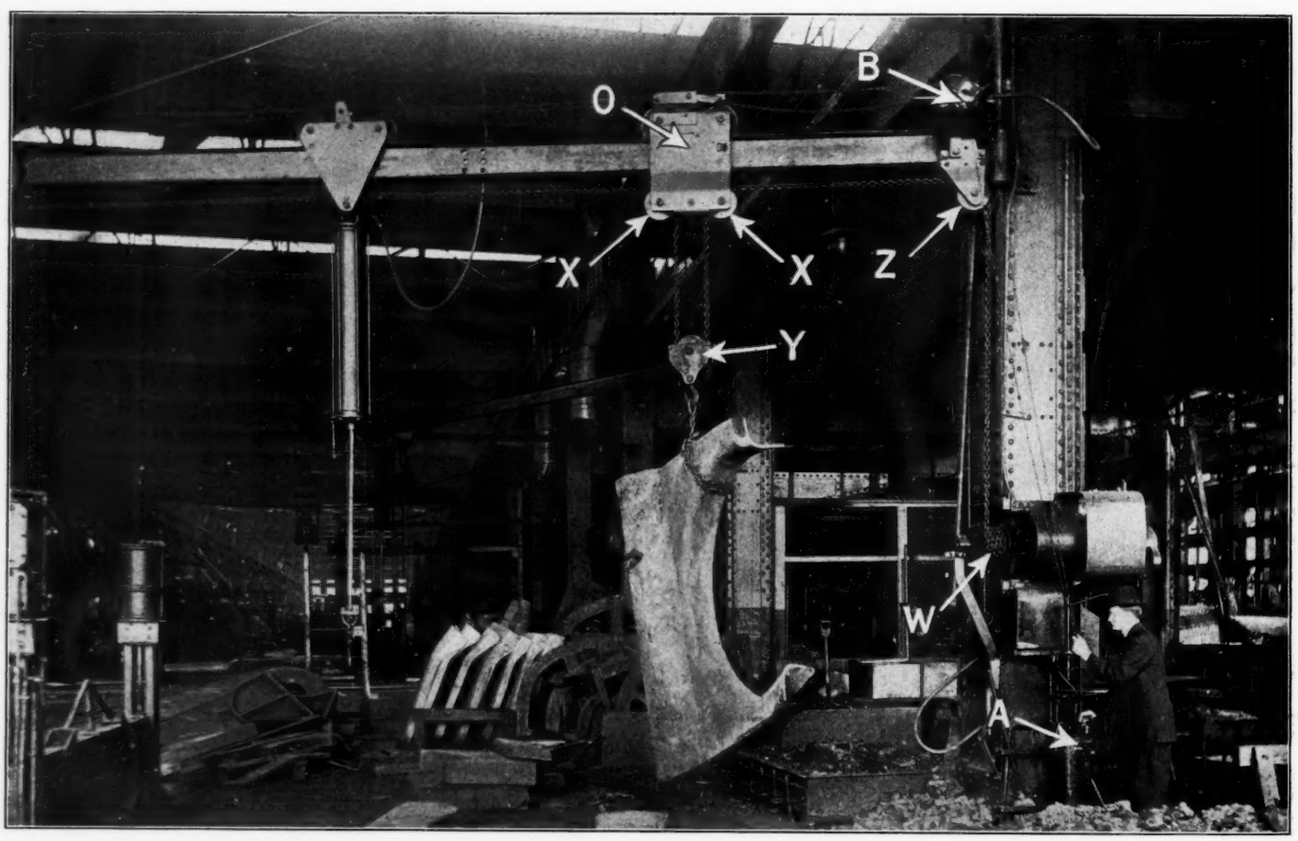


Fig. 1—Air-Electric Hoist Used in Connection with the Flanging of Boiler Sheets.

M. At C is shown a hand release of the brake, for the sensitive lowering of the load. This lever operates the plunger D, which raises the brake lever E, releasing the brake band without applying the electric power, and the load can be lowered very slowly and be stopped at any point.

As may be seen from Fig. 1, the application of the hoist does not interfere with the original air hoist on the girder, as the carriage O when not in use is run back close to pulley Z, allowing nearly the full length of the girder to the work that may be more conveniently handled with the air hoist. As this air hoist has but two positive points of suspension—that is, when the piston is at the extreme top or bottom—and as its lift is but 6 ft., the advantages of the electric hoist are apparent, as the work can be held at any desired height up to 16 ft. and its lifting capacity is 2,000 lbs.

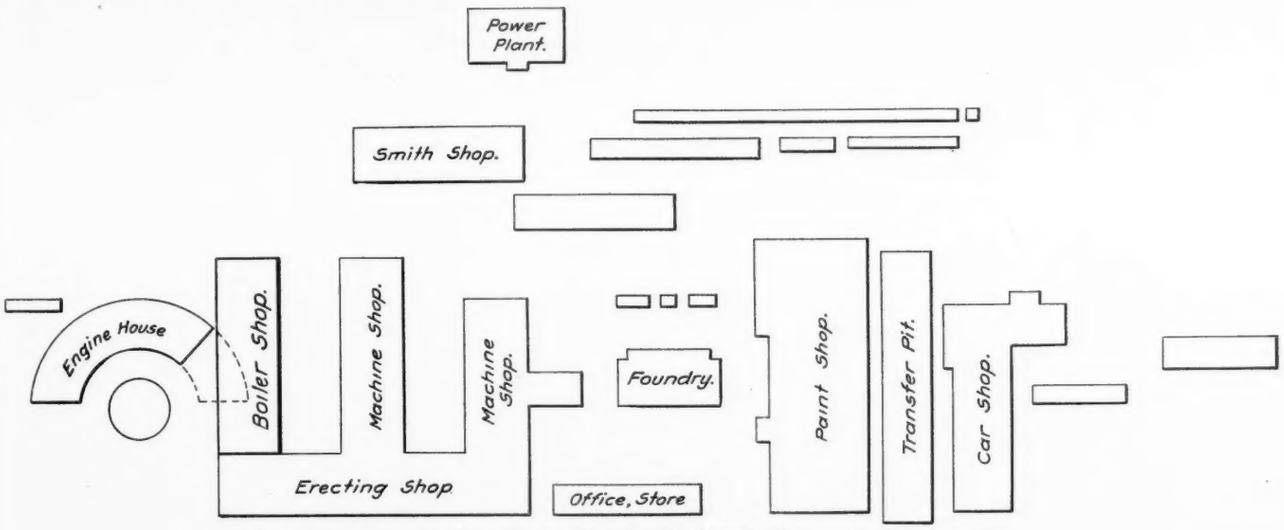
NEW BOILER SHOP OF THE PENNSYLVANIA RAILROAD AT RENOVO, PA.

The locomotive repair shops of the Pennsylvania Railroad at Renovo, Pa., have been enlarged in recent years by the addition of a modern erecting shop, a new smith shop and a power house. The erecting shop has longitudinal tracks parallel to the main line tracks and the two machine shops are at right angles to the erecting shop, with large openings into the latter.

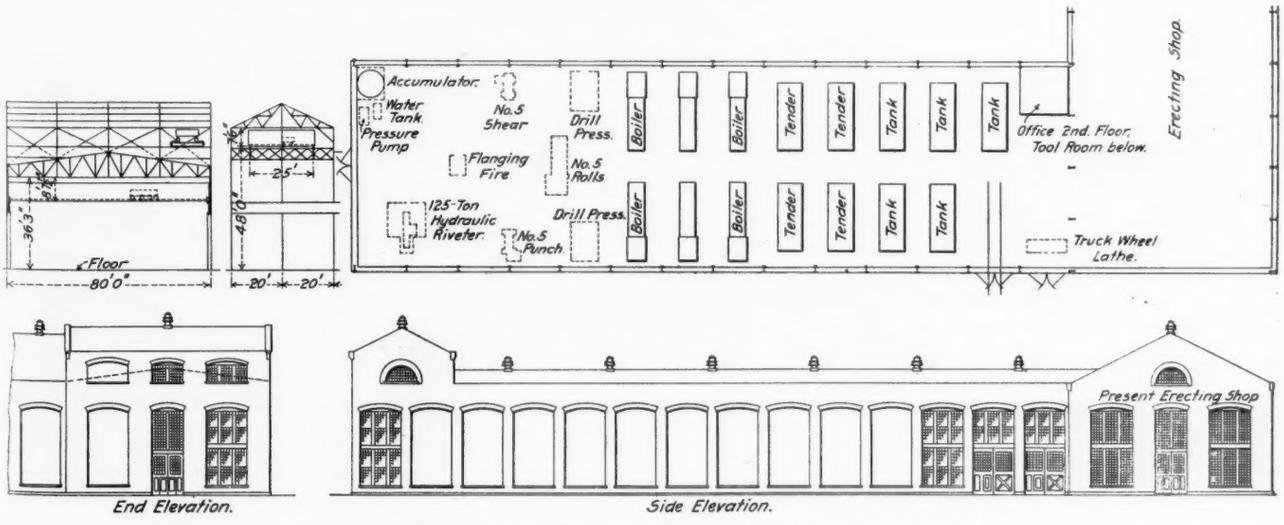
The new boiler shop will complete the group, forming another L at the extreme end of the erecting shop and cutting off a portion of the old engine house. This location was decided on, not only because it is convenient for the boiler makers working in the erecting shop and for the transfer of material between these shops, but because the limited ground available for shop additions at Renovo made a compact arrangement necessary. The general plan shows the relation of the new boiler shop to the other buildings. The windows and doors in the new building are similar in construction and general appearance to those in the erecting shop and the height of the side walls is the same, but the slope of the roof is much flatter, having an inclination of only 1½ in. to the foot.

In these two buildings the usual upper decks have been dispensed with, making a simpler and more clean-cut construction. The architecture is similar to that of the Pennsylvania locomotive shops at Juniata. The new boiler shop is 80 ft. wide and 280 ft. long; the height of the side walls is 42 ft. and the distance to the lower side of roof truss is 36 ft. 3 in. At one end of the shop is a riveting tower 40 ft. wide, and here the side walls are 62 ft. high and the distance to the lower side of the roof truss is 65 ft. 6 in.

At the riveting tower the shop is spanned by heavy crane girders for a transverse electric crane trolley; the height from the floor to the top of the crane girder is 47 ft. 6⅞ in. There are supports for longitudinal cranes having spans of 75 ft. 8 in.,

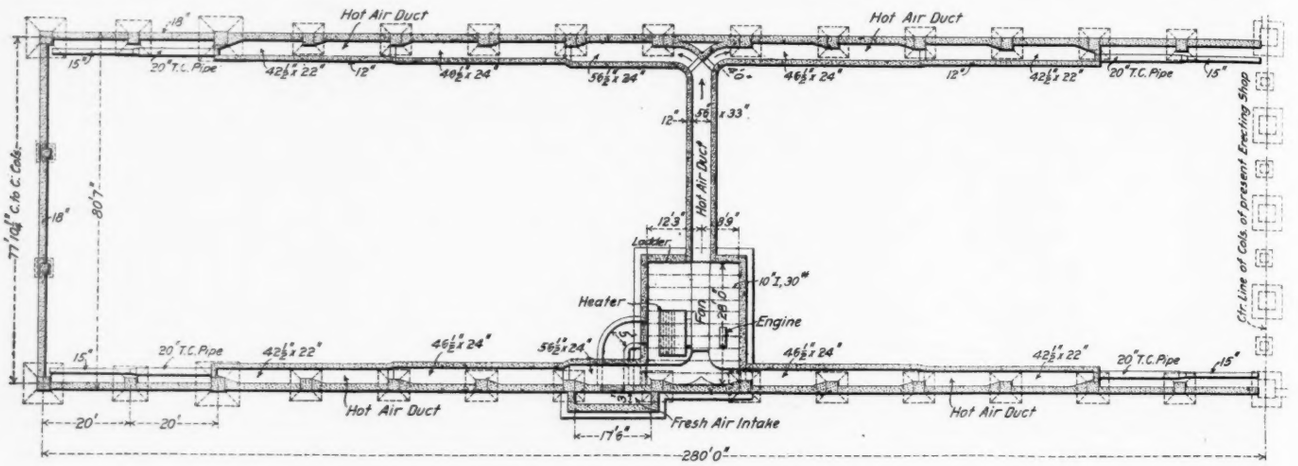


Arrangement of the Pennsylvania Railroad Shops at Renovo, Pa.



New Boiler Shop at Renovo, Pa.—Pennsylvania Railroad.

center to center of rail, and there will be three Shaw electric cranes, as follows: One 60-ton crane with five motors and two trolleys for the boiler shop proper; one 50-ton crane with three motors for the riveting tower; and one 15-ton crane with three motors for the shop yard. On one side of the shop the crane girders for the yard crane are supported on brackets on the exterior walls, and similar brackets will be placed on the walls of the machine shop opposite.



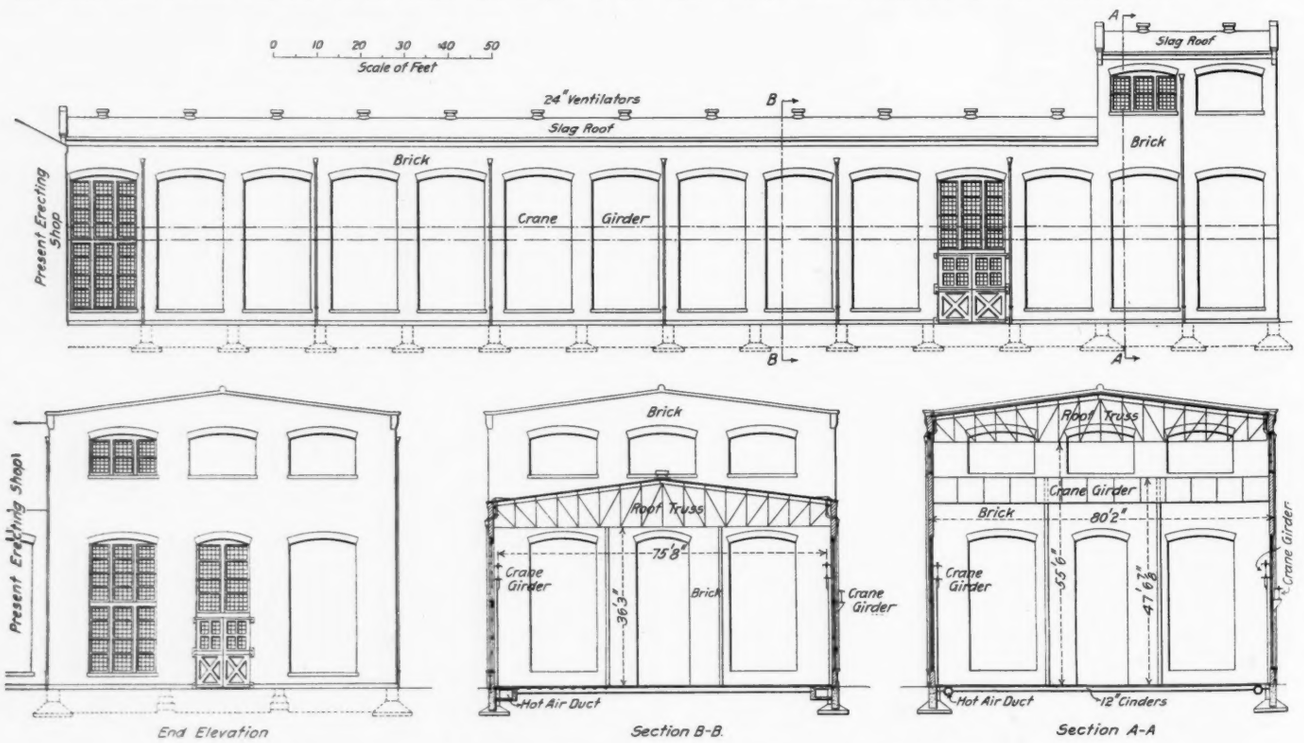
Arrangement of Heating Ducts in Boiler Shop.

The floor of the boiler shop is made of 3-in. yellow pine plank laid on 4 by 6-in. yellow pine sleepers and these are embedded in 12 in. of cinders. The wearing surface is maple. The roof consists of 3 by 4-in. hemlock nailing pieces bolted to the 10-in. channel purlins. On this is laid 1¾-in. sheeting, covered with a slag roof.

The heating system is of the hot blast type, with the fans and heating coils located in a pit 21 ft. by 28 ft. inside and at one side of the shop; a fresh air intake is provided by a slight projection beyond the shop walls. The whole underground system for conducting hot air is made of concrete with 12-in. walls. The main duct crosses the shop at the center and is 4 ft. 8 in. by 2 ft. 9 in. It passes along the opposite walls and gradually reduces as it reaches the ends of the shop. A similar duct passes along the walls at the side of the shop the fans are located on. The plan view shows the location of the hydraulic system which includes a pressure pump, accumulator and a 125-ton hydraulic riveter; also punches, shears and drills. It also shows the shop occupied by six locomotive boilers and nine tanks, all of them placed transversely.

NEW URUGUAYAN RAILWAY CONCESSION.

The Pan American Transcontinental Railway Company has secured a government concession for a line to extend 370 miles from Colonia, on the River Plate opposite La Plata, in Argentina, to San Luis, in the department of Rivera on the Brazilian border, from which it will continue to Bage, in Brazil. A 60-mile branch will be built from a point near the village of Carmen, northeast of Durazno, to Corro Chato, where junction will be effected with the Central Uruguay road.



Elevations and Sections of Pennsylvania Boiler Shop at Renovo, Pa.

TOOL REGULATIONS.

The cost of repairs and renewals to shop machinery and tools on the Atchison, Topeka & Santa Fe has decreased greatly during the past seven years, as indicated by the following table,

Fiscal year ending June 30.	Tool account.	Gross earnings.
1904	$487,170	$68,171,200
1905	486,620	68,375,837
1906	367,474	78,044,347
1907	315,844	93,683,406
1908	290,832	90,617,796
1909	289,633	94,265,716
1910	232,766	104,690,184

although the gross earnings per year have increased over fifty per cent. during that period. At the same time the condition of the shop tools has been constantly improved, so that to-day they are in much better shape than ever before. These surprising results are due to the standardization of the tools, the centralization of their manufacture at Topeka, Kan., and the closer custody of tools of all kinds. The standards governing machine tool equipment, small tools, shop facilities and methods, and the regulations concerning them, have been published for the convenience and instruction of the various officers and employees interested. The volume of 463 pages is in loose leaf form in substantial covers and is carefully indexed for ready reference. Naturally it is composed largely of illustrations and includes sections on: Standard methods, abrasive wheels and stands, automatic forming machines, bench vises and stands, blacksmith hand tools, boiler maker tools, erecting shop devices, furnaces and portable forges, general hand tools, jigs, templets and gages, machine tools and holders, power appliances, reamers, shear blades, shop wagons, special finishing tools, special machines and cutters, special machine devices, stocks and dies, and taps.

The introductory portion includes the tool regulations in force at present and is as follows: Proper and economical work depends upon the tools used, the condition in which they are kept, and their availability for service when needed. In order to facilitate the work in this way system must be used in the care and distribution of tools, so that excessive amounts of them will not be accumulated, and expensive tools will not be kept idle in one place when they are needed in another; system must also be used in the standard designs of tools and the methods of doing work. With these objects in view, all decisions as to designs of tools, jigs, special devices, etc., and as to methods of doing work will be made after reference through the office of the assistant superintendent of motive power, at Topeka. All suggestions as to changes in methods and all ideas as to changes in design of tools, devices, etc., or as to new forms of tools or new jigs and devices, must be submitted to that office in duplicate, and receive the approval of the assistant superintendent of motive power, before they can be put into effect or be adopted. This is necessary, as often ideas and methods are developed at considerable expense in one place, when they have been already tried and proved unsatisfactory elsewhere. This useless expense should be avoided. Recommendations may be made either through the regular channels, or directly by the men.

A system for checking tools from the tool-room, checking them up in the tool-room, and inspecting them while out of the tool-room, has been developed from the best practice in use at first-class shops and will be thoroughly installed in all tool-rooms on this system.

This tool system will comprise the following features: Perpetual or continuous inventory will be had of all tools, machines and devices of all sorts at each shop, showing location of tool and whether assigned to tool-room stock or to the permanent use of an individual workman or gang.

Uniform aluminum checks of special design, six to each man, will be furnished from Topeka for each shop, indicating the shop and the block number of the mechanic to whom issued; these checks will be issued only to such men as need to call on the tool-room for tools. Topeka will be called on for such checks as are required from time to time, which will be forwarded by railway mail.

Standard tool lockers will be assigned to men using tools, as far as practicable.

Standard tool kits, for each class of occupation, will be determined upon and these kits supplied to the man when he enters the employment, he signing for it and being held responsible therefor; the man will also be held responsible for the checks issued.

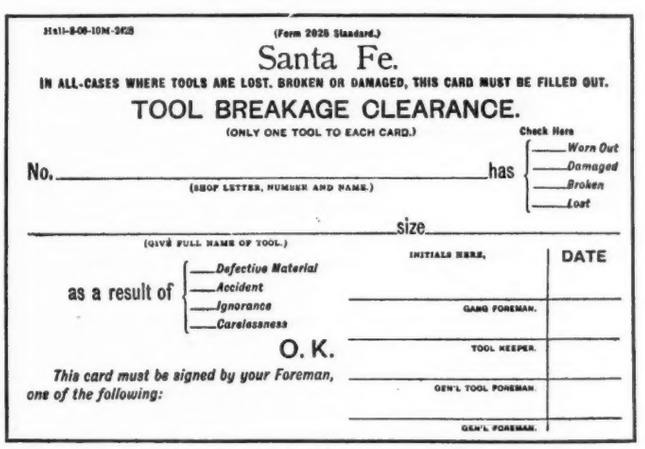
A regular weekly inspection system of all tools will be inaugurated as rapidly as it can be organized. In addition to these general measures the following special regulations will be in force:

No tools issued from the tool-room except in exchange for a tool-check.

No new hand-hammers or monkey wrenches to be given in exchange for old ones unless accompanied by an order from the gang foreman and marked "O K" by the shop foreman; chisels and soft hammers to be the only tools exchanged for new ones without a written order.

No letters or figures to be given out in lots of less than a full set.

All tools out on check must be turned into the tool-room every Saturday night before the tool-keeper leaves the shop. In all cases where tool-checks remain on the board over Sunday, the tool-keeper should notify the tool-room foreman or the


(Form 2026 Standard.)

Santa Fe.

IN ALL CASES WHERE TOOLS ARE LOST, BROKEN OR DAMAGED, THIS CARD MUST BE FILLED OUT.

TOOL BREAKAGE CLEARANCE.

(ONLY ONE TOOL TO EACH CARD.)

Check Here: Worn Out, Damaged, Broken, Lost

No. _____ has

(SHOP LETTER, NUMBER AND NAME.)

_____ size _____

(GIVE FULL NAME OF TOOL.)

as a result of: Defective Material, Accident, Ignorance, Carelessness

INITIALS HERE. DATE

GANG FOREMAN.

O. K.

TOOL KEEPER.

This card must be signed by your Foreman, one of the following:

GEN'L TOOL FOREMAN.

GEN'L FOREMAN.

Fig. 1—Tool Clearance Card.

general foreman, and the men whom these checks belong to should be required to give an explanation for not returning them. In some shops it may be desirable to check up the tools daily.

In all cases of broken, lost or damaged tools, the tool-check will not be returned until the tool clearance card has been personally signed by the general foreman.

In places where, in addition to tools, the tool-room is used for a sort of shop sub-store for small engine supplies, such as cutters, small bolts, etc., the gang foreman's orders will be honored for these supplies.

The custody of all high-speed lathe, planer, and boring-mill tools should come under the tool-room foreman, or the man in charge of the tool-room. A man starting to work on a machine requiring these tools should be given a set and these should be charged to him. Should he break one of the tools, he will exchange it for a new one at the tool-room. The tool-room foreman or the tool man should get a list of the high-speed tools, the list showing size and style now at various machines and the workmen should sign for them.

All air motors must be returned to the tool-room every Saturday night and thoroughly inspected and oiled before leaving the tool-room again. At shops like Topeka, Albuquerque, San Bernardino, and Cleburne, it may be desirable to assign certain motors to a gang and that this gang be allowed to use the motors during the week, turning them into the tool-room on Saturday night for regular inspection. All motors should be numbered and a record kept of what gang they have been assigned to.

Where parts of motors are missing the motors should not be accepted without authority of the tool-room foreman. It should be the tool-room foreman's duty to see that all motors are regularly inspected, repaired and oiled as often as necessary, which, for motors in service, should be as often as once a week.

When a tool is lost or broken, a clearance card (Fig. 1) properly signed must be presented at the tool-room by the workman responsible before the tool-check will be returned to him. At the close of each month, the clearance cards from all the shops are sent to the supervisor of tools at Topeka, who checks them up and takes such action as he feels necessary for the improvement of the tool service. In this way losses and breakages of tools are reduced to a minimum and information is obtained regarding defective design and construction of tools and shop devices.

Each shop is provided with a stock book. Before the first of each month the books are filled out in the column for the current month, showing the tools on hand and those needed. On the first of the month the books are forwarded to the supervisor of tools, along with requisitions for the tools ordered. The tools ordered are checked with those on hand and the requisitions are approved or changed as judgment dictates. The requisitions are then sent to the storehouse and filled. The stock books are returned with letters advising the disposition of the requisitions.

A form (Fig. 3) is arranged to show in detail the various charges to repairs and renewals to shop machinery and tools at each shop. One copy is made out monthly by the master mechanic showing the labor charges to this account and one copy by the division storekeeper showing the material charged to it. These are forwarded monthly to the motive power accountant, who checks the total labor charges with the daily distribution, as sent from each shop. The forms are then forwarded to the supervisor of tools.

One of the illustrations (Fig. 2) shows the upper part of one page of the stock book in which are kept records of the tools on hand and on order. In the book are listed the standard tools and devices in stock at Topeka subject to requisition.

(Form 1077 Standard)

Santa Fe

STOCK BOOK_____

Section_____

Catalogue Page	DESCRIPTION OF ARTICLES	Symbol Number	Units of	JUNE		JULY		AUGUST		SEPTEMBER	
				Inventory	Ordered	On Hand	Ordered	On Hand	Ordered	On Hand	Ordered

Fig. 2—Upper Part of Page of Tool Stock Book.

Form 2033 Standard

Santa Fe

(Insert name of Railway Company.)

REPAIRS AND RENEWALS TO SHOP MACHINERY AND TOOLS: Account 47. (Replacing Old Account 17.)
AND CHARGES TO POWER PLANTS, EXCEPT ENGINES, BOILERS AND MACHINERY CHARGEABLE TO OTHER ACCOUNTS.

AT_____SHOPS, DURING_____190__

	SHOPS	Renewals large machinery in Replacement of Old and charged to Account 47 (0)	Repairs and Renewals to Machinery Appliances, shafting, etc., except as otherwise designated on this form. (1)	Making New Tools for use with Machines (2)	Repairs to Tools for use with Machines, including Dressing (3)	Repairs and Renewals of Power Engines and Boilers in Shops, etc (4)	Repairs and Renewals to Air Line and Air Tools (5)	Repairs and Renewals of Abrasive Wheels (6)	Repairs and Renewals of Belts (7)	Repairs to Electrical Machinery, including Cranes (8)	Other than Foregoing * (9)	TOTAL
47-A	Machine, 11											
47-B	Erecting Shop, 12											
47-C	Boiler Shop, 13											
47-D	Blacksmith Shop, 14											
47-E	Tin Shop, 15											
47-F	Brass and Air Room, 16											
47-G	Tool Room, 17											
47-H	Water Service, 18											
47-I	Pattern Shop, 19											
47-K	Car Machine Shop, 20											
47-L	Loco. Carpt. Shop, 21											
47-M	Wheel and Axle Shop, 22											
47-N	Power Plant, 23											
47-O	Miscellaneous, 24											
	TOTAL,											

This account includes REPAIRS.
Cost of material used and labor expended in repairing tools and machinery in engine houses and at locomotive and car shops and foundries
Column No. (4) Including stationary engines and boilers for furnishing power.
(1) Scaffolding and shafting.
(7) Belting.
(1) Other appliances for running machinery, cranes, hoists, power and hand (except electrical), drop tables, jacks and other appliances used in connection therewith also in repairing furnaces, forges, hydraulic and other portable jacks.
Portable scales and sewing machines used in shops. Cost of repairing heating boilers should be charged to account 16, "Buildings, Fixtures and Grounds."

RENEWALS: Cost of new tools: (1, 2 and 5).
Column No. (0) Machinery (less salvage), used in engine houses and at locomotive and car shops and foundries.
(4) Including stationary engines and boilers for furnishing power
(1) Scaffolds and shafting.
(7) Belting
(1) Other appliances for running machines.
(0) Cranes.
(1) Hoists (power and hand).
(0) Drop tables
(1) Jacks and other appliances used in connection therewith
(0) Furnaces and forges.
(1) Hydraulic and other portable jacks. Portable scales and sewing machines used in shops.
Cost of renewing heating boilers should be charged to account 16, "Buildings Fixtures and Grounds."
*NOTE.—Give explanation on separate sheet of each individual item constituting charges in this column.

Date_____

Storekeeper. Motive Power Accountant.

Fig. 3—Form for Charges to Repairs and Renewals to Shop Machinery and Tools.

General News Section.

The telephone is to be substituted for the telegraph on the Queen & Crescent between Danville, Ky., and Oakdale, Tenn., 137 miles.

Members of the Brotherhood of Locomotive Engineers, at a meeting in Washington last week, discussed a plan for securing an increase of pay for enginemen on the Pennsylvania Railroad. They want $200 a month on the main lines and $150 on the branches.

At Wilkes-Barre, Pa., on the morning of October 27, Special Policeman William Weathers, of the Lehigh Valley, who, in company with another officer, was hunting for men who had tampered with automatic block signals, was shot and killed by one of two unknown men, who ran into the woods and escaped.

Surgeons of a number of the principal railways in the southwest have organized "The Association of Railway Surgeons of the Southwest." The president is Dr. D. K. Angle, of Silver City, N. M. The executive committee will have one member from each state and territory interested, and one from Mexico.

Major Flagler, United States engineer, announces that the Cumberland river is now navigable for 125 miles above Nashville, this being made possible by the recent completion of locks No. 6 and No. 7. With these improvements the river is canalized so that boats can run all the year round to a point above Carthage.

Railway employees in New York state are said to be preparing to vote for that one of the candidates for Governor of the state who will give them the most satisfactory promise in response to their question as to whether a "railroad man" will be appointed to a place on the Public Service Commission of the Second district.

At Columbus, Ohio, last Sunday, a meeting participated in by 300 members of the four principal railway brotherhoods, adopted resolutions calling on the Interstate Commerce Commission to permit the railways to make their proposed increases in freight rates; only by granting the wishes of the roads in this matter can the commission give them a "square deal."

On Monday, October 31, Ralph Johnstone, in a new and small biplane made by the Wright brothers, rose to a height of 9,174 ft. at Belmont Park, near New York City. This is 548 ft. higher than anyone has ever before soared in an aeroplane. In France, October 28, Maurice Tabuteau, in a Farnam biplane, flew 289 miles in six hours, without a stop, winning a premium of $4,000. This record was made in the aerodrome at Etampes.

A meeting has been called for November 2 in Indianapolis to organize into one body all the employees of the Cincinnati, Hamilton & Dayton who belong to unions affiliated with the American Federation of Labor. There is at present a railway department of the American Federation of Labor, and the body to be organized will be a part of it. The local organization will include boilermakers, machinists, carpenters, painters, car repairmen, telegraphers, switchmen, blacksmiths, firemen, enginemen, pipe fitters and coppersmiths.

The Men's Club of the Presbyterian Church of Chillicothe, Mo., has invited J. R. Koontz, general freight agent of the Atchison, Topeka & Santa Fe, and the other officers of this road who have been making harmony tours in Kansas, to address the members of the club on Sunday, November 6, and the invitation has been accepted. J. D. M. Hamilton, claims attorney of the Santa Fe, will be the principal speaker, and the subject of his address will be "The Railway and Its Employees and Their Relation to the People and the Government." This is the first Sunday engagement which the Santa Fe's harmony tourists have arranged to play!

The Illinois supreme court rendered a decision on October 28 requiring the Illinois Central to make an accounting to the state of Illinois to show whether or not it has since 1905 paid to the state the 7 per cent. of its gross earnings which it is required to pay by its charter. The state brought suit to compel an accounting for the period from 1878 up to the present time, but the court held that an accounting prior to the year 1905 could not be required. The Illinois newspapers have stated that the decision is a victory for the state. It settles nothing except that a new accounting must be made, and does not determine whether or not the Illinois Central has failed to pay to the state all to which it is entitled.

A strike of express wagon drivers, which began in Hoboken, N. J., last week, extended to New York and Jersey City and very seriously hampered the business of all the express companies for nearly a week. Little reliable information was given out by the companies or by the strikers, but an increase of pay and a shortening of the hours of work were the main points at issue. Disorder and rioting accompanied the strike from the very first, and although the police were vigilant there were many outbreaks, showing that either the strikers and their friends or the hoodlums of the city were in a decidedly ugly mood. There were many small disturbances in various parts of the city as strikers attacked wagons manned by strike-breakers. Stones and missiles of all kinds were thrown, and several drivers and their helpers were badly hurt. William Hoyt, a helper on an American Express wagon, had his skull crushed with a brickbat and was expected to die. All the disturbances were quickly quelled by the police, who dealt in no gentle manner with the strikers. Many arrests were made and heavy fines imposed. By Tuesday the police department had on duty 2,500 extra men and succeeded in maintaining order. The strikers were said to number several thousand, but the reports were very indefinite. The larger companies brought several hundred men from other cities and by Tuesday were moving all of their perishable freight and some of the ordinary merchandise. The principal railway stations and the depots of the express companies were guarded by strong forces of policemen and one or two officers accompanied every wagon that was sent out.

Congressman Mann Opposes Valuation of Railways.

Congressman James R. Mann, of Illinois, chairman of the committee of the National House on Interstate and Foreign Commerce, made a speech to the National Industrial Traffic League at Chicago on October 27, in which he deprecated the demand for a physical valuation of railways; such a valuation would show that it would cost more to produce the railways than they are capitalized for and might result in raised freight rates.

On the subject of regulation of the issuance of securities, he said that railway securities constituted a delicate mechanism, the slightest jarring of which might cause great injury to the country; it would be a catastrophe if legislation were enacted which should prevent the development of the railways. He was glad when both houses struck from the Mann-Elkins Act the provision for regulation of railway securities. But Congress will in some way regulate securities to the end that the issuance of stocks and bonds not based on actual investment shall be prevented.

Proposed Headlight Legislation in South Dakota.

One of the humors of the present political campaign is that the question of whether the railways of South Dakota shall or shall not be required to equip their passenger locomotives with electric headlights has been submitted to popular vote in that state on a referendum ballot, to be voted at the general election on November 8. The act does not specifically require the use of electric headlights or any other kind of headlights, but it does require the use of headlights of not less than 1,500 candle power without the aid of a reflector, and no headlight has 1,500 candle power without the aid of a reflector except an electric headlight. The law also proposes to give the railway commissioners power to order headlights of such candle power as they may deem necessary on all locomotives other than those used on passenger trains.

The "little ballot" on which this proposed law is submitted to the people is over 6 ft. long and the various measures appearing on it are printed in very fine type. The law gives the voter three minutes in the election booth in which to decide how he

shall vote and to prepare his ballot. Of course, the farmers and country storekeepers of South Dakota are very much better qualified than the officers of the railways to decide what kind of headlights shall be used on their engines. The proposed legislation raises one very interesting question, however. Some roads, the Chicago & North Western, for example, run trains directly from Nebraska into South Dakota and *vice versa*. Suppose the people of Nebraska should require the railways to use some other kind of a headlight. Would it be necessary in that event for the North Western to stop all of its engines at the state line both going and coming, and change its headlights? If a train ran through three states it would, no doubt, be necessary to carry one headlight on the front of the engine and two in the cab, so that it would be prepared for all contingencies.

The penalty for each violation of the South Dakota law would be a fine of not less than $100 nor more than $1,000.

The Pyle-National Electric Headlight Company, by its president, R. C. Vilas, has issued a statement to the people of South Dakota, asking them to defeat the proposed electric headlight law, and is circulating it broadcast throughout the State. Mr. Vilas says in part:

"We are now, and always have been, against legislation of this nature, because we believe that the railways, under free competition, will naturally select the device best adapted to the protection of their own property and of the passengers intrusted to their care, and while we have heretofore scrupulously refrained from suggesting or criticizing any proposed legislation in this direction, we believe that now, when the question comes directly before the people, it is time for us to state distinctly and emphatically that we do not believe in and do not favor legislation of this kind. The electric headlight has proved a very useful and valuable device in railway operation. That this is true is demonstrated by the fact that it is being used by every railway system west of the Mississippi river and on every one east of the Mississippi and south of the Ohio river in numbers varying from 3 to 1,200; but we do not believe that the railways should be required by law to use it under all conditions, either in passenger or any other service. The managers of the railways, in our opinion, are the best qualified of all persons to decide when its use is necessary and when it is not.

"We know from long experience in dealing with them that they are even more anxious to make their service safe than any other class of persons is to have them do so. We, therefore, desire emphatically to express the opinion that the settlement of the question of the extent to which railways should use electric headlights should be left entirely to the officers of the railways.

"It may be said that they have not done all that they ought to do to make transportation safe, but our experience leads us to believe that they have done and are doing all that is practicable in this direction. For example, on June 30, 1909, according to the statistics of the Interstate Commerce Commission, there were in use in the United States, 57,212 railway locomotives, and of these no less than 12,000 had been equipped with electric headlights made by this company. Furthermore, the roads in all parts of the country are still buying large numbers of electric headlights, not only in states where laws have been passed or orders issued by railway commissions to require them to do so, but also where no such laws have been passed and no such orders have been issued. In this respect, and in all others, the railway managers are, we believe, doing all that they can with the financial means at their command to make their service satisfactory and safe, and does it not appeal to the people of South Dakota as unfair that when railway managers are pursuing this policy they should be harassed and burdened with arbitrary legislation, whose effect may be not only to require them to do things that they ought to do, but also to require them to do some things which their experience and sound judgment lead them to think should not be done and to prevent them from doing things which their experience and sound judgment lead them to think should be done? If they have proved worthy to be trusted in large matters, have they not proved themselves worthy of being trusted in this relatively small matter?

"This open letter to the public of South Dakota is not written at the suggestion of any officer of any railway, we have not consulted with any railway man about it, and no railway man knows that it is being written. We believe that the railways are being injured by unnecessary, unfair and burdensome legislation. Because of this kind of legislation, they have become unable, within recent years, to spend as much money for supplies, equipment and construction as under other circumstances they would have spent. Their inability to spend as much money as they would have liked to have spent is injuring the railways, and the manufacturers, and is injuring indirectly the people of the whole country, including those of South Dakota. If legislation of this kind continues, it will continue to do more and more harm. Therefore, in spite of the fact that this particular piece of legislation, if passed, would inure to the benefit of this company, we urge the people of South Dakota to vote against it and against all other unfair measures for the regulation of railways which may be presented to them."

Employers' Liability in Great Britain.

The statistics of proceedings under the British Workmen's Compensation Act, 1906, and the Employers' Liability Act, 1880, during 1909, give substantially complete returns from the seven great groups of industries—mines, quarries, railways, factories, harbors and docks, constructional works and shipping. In the seven groups the number of employers included in the returns was 117,391, and the average number of persons employed coming within the provisions of the act was over 6,500,000, of whom 4,500,000 come under the heading "factories." In these industries in the year 1909 compensation was paid in 3,341 cases of death and in 332,612 cases of disablement.

The average payment in case of death was £154 ($770), and in case of disablement £5 6s. ($26). The annual charge for compensation, taking the seven groups of industries together, averaged 6s. 10d. ($1.64) per person employed. It was lowest in the case of persons employed in factories, being only 3s. 5d. per person; in the case of railways it was 7s. 1d.; it rose to 9s. 2d. in quarries, to 10s. 8d. in shipping, and to 14s. 11d. in constructional works; it was highest in docks, 16s. 8d., and in mines, 20s. 1d. Allowing for industries not included in these returns it is calculated that the total amount of compensation paid in all industries will hardly fall short of three millions of pounds. These figures include, in addition to accidents, cases of the various industrial diseases (now 24 in number) included under the Workmen's Compensation Act. Compensation was paid, as is shown in the table, in 33 cases of death from disease and in 3,313 cases of disablement. The bulk of these cases, 82 per cent. of the total, occurred in the mining industry, and were due mainly to nystagmus, beat hand, beat knee and beat elbow. Of the remainder 497 were cases of lead poisoning.

Only a very small proportion of the claims under the act become the subject of litigation. The total number of cases under the Workmen's Compensation Act which were taken into court in 1909 was 8,254, but a half of these were settled out of court. The number of claims to compensation which have to be settled judicially is less than one in five in fatal cases and less than one in 200 in cases of disablement. Of the 3,087 cases settled judicially in England under the act, the decision was in favor of the applicant, that is, the workman, in 2,427, or 79 per cent. of the cases.

Commerce Court for Connecticut.

Charles S. Mellen, president of the New York, New Haven & Hartford, proposes that Connecticut have a commerce court. He says:

"Let the legislature provide three additional judges of the superior court. Let the chief justice of the supreme court from time to time assign a judge or judges of the superior court to conduct the sessions of the court of commerce. This court should have legislative authority to act under its own simple rules of procedure and of evidence, which should be so framed as both to prevent delays in the settlement of controversies and also to give the freedom of inquiry necessary for the effective investigation and speedy and just determination of difficult and complex commercial questions. Such a court would be better adapted to deal with a good many intricate commercial controversies than the ordinary court of justice with its technical and rigid procedure. But I now propose such a court only for the determination of controversies as to the reasonableness and fairness of charges made and services afforded by those who serve the general public, including particularly the so-called public service corporations.

"A commission sits and acts as a branch of the executive power and therefore must be free from many wholesome restraints against the arbitrariness and injustice with which the law has surrounded judicial activities. The life training of our judges peculiarly fits them to weigh evidence, to analyze a complex mass of facts and to apply logically and justly to the relevant facts the rules of law and right reason properly controlling the issues of the controversy. I feel, moreover, in common with other men of sober thought, that our judges are peculiarly protected by the traditions of their high office and by constitutional guarantees in the independent single minded administration of justice. I ask for the railways the right to have controversies affecting important property rights tried before a properly constituted judicial tribunal."

All of which, translated, seems to be a plea, not for the establishment of a court but for the appointment of judicial minded men on the railway commission.

Effect of Fire on Concrete.

A fire occurred in a building of reinforced concrete and brick. The original estimate of loss was made on the basis that the concrete floors and ceiling were not damaged sufficiently to be torn down. The owner refused to accept these figures, claiming that the concrete had been damaged and weakened. He requested that the building be tested by putting on a weight of 400 lbs. to the square foot, and if the flooring deflected more than $\frac{1}{16}$ in. it was defective and would have to be removed. This was the original test made by the architects when building was completed and turned over to the owner.

A panel 14½ ft. x 18½ ft. in the northeast corner of the building was first tested, and when a weight of 250 lbs. to the square foot was put on the floor deflected $\frac{1}{16}$ in. Another panel was tested and a deflection of ¼ in. to 250 lbs. was noted. There were eight panels, all approximately 14½ ft. x 18½ ft., which were involved in the fire, and as a further test it was decided to try one panel in another part of the building which had not been damaged by the fire, in order to see how it would show up. The sand used for testing was therefore removed to this panel, and with the same weights, viz., 250 lbs. to the square foot, this panel did not deflect over $\frac{3}{32}$ in.

The test seems to demonstrate the virtues as well as the defects of concrete construction. As there were about 60,000 lbs. of powdered drugs burned, a tremendous heat was created which would have meant a total loss to the building had it been of any other construction. At the same time, there is indicated by these tests a defect in concrete which it may be impossible to overcome, and that is, that the reinforcing steel used in its construction undoubtedly expands under a certain heat, causing the concrete to weaken.—*National Fire Protection Association Quarterly.*

American Society of Civil Engineers.

At the meeting held on November 2, a paper by C. R. Grimm, M. Am. Soc. C. E., entitled "The Arch Principle in Engineering and Esthetic Aspects, and its Application to Long Spans," was presented for discussion. This paper was printed in the September number of "Proceedings."

American Society of Mechanical Engineers.

A paper on the Rotary Kiln, by Ellis Soper, Detroit, Mich., will be presented at the New York meeting of the society on November 9. Following this paper, Charles Whiting Baker, editor of *Engineering News,* will give an illustrated lecture on the Panama canal. The date of this meeting has been changed from the customary one because the meeting would have come this month on election day.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.
AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.; next meeting June 22, 1911; Niagara Falls, N. Y.
AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn.
AMERICAN ASS'N OF LOCAL FREIGHT AGENTS' ASS'N.—G. W. Dennison, Penn. Co., Toledo, Ohio.
AMERICAN ASS'N OF RAILROAD SUPERINTENDENTS.—O. G. Fetter, Carew Bldg., Cincinnati, Ohio.
AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York.
AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago; Sept. 17-19, 1911; St. Louis, Mo.
AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASS'N.—E. H. Fritch, Monadnock Bldg., Chicago; March 21-23, 1911; Chicago.
AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.; May 6, 1911; Detroit, Mich.
AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Building, Chicago.
AM. RAILWAY TOOL FOREMEN'S ASS'N.—O. T. Harroun, Bloomington, Ill.
AMERICAN ROADBUILDERS' ASSOCIATION.—Dec. 6-9; Indianapolis, Ind.
AM. SOC. FOR TESTING MATERIALS.—Prof. E. Marburg, Univ. of Penn., Phila.
AM. SOC. OF CIVIL ENGS.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; annual, Jan. 18-19; New York.
AM. SOCIETY OF ENGINEERING CONTRACTORS.—D. J. Haner, 13 Park Row, New York.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 29th St., New York; annual, Dec. 6-9; New York.
AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.
ASSOCIATION OF AM. RY. ACCOUNTING OFFICERS.—C. G. Phillips, 148 Dearborn St., Chicago; April 26, 1911; New Orleans, La.
ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago; May, 1911; Montreal, Can.
ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS—G. B. Colegrove, I. C. R.R., Chicago.
ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 185 Adams St., Chicago; June 19, 1911; Boston.
ASS'N OF TRANS. AND CAR ACC. OFFICERS.—G. P. Conard, 24 Park Place, N. Y.; Dec. 13-14, Chicago; June 20-21, 1911, Cape May City, N. J.
CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
CANADIAN SOCIETY OF CIVIL ENGS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays; Montreal; annual, last week January.
CAR FOREMAN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month; Chicago.
CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—D. F. Jurgensen, 116 Winter St., St. Paul; 2d Monday, except June, July, and Aug.; St. Paul.
ENGINEERS' SOCIETY OF PENN.—E. R. Dasher, Box 704, Harrisburg, Pa.
ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton Bldg., Pittsburgh; 1st and 3d Tues.; annual, Jan. 17, 1911; Pittsburgh.
FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.; 20th annual, June 21, 1911; St. Paul, Minn.
GENERAL SUPERINTENDENTS' ASS'N OF CHICAGO.—H. D. Judson, 209 Adams St., Chicago; Wednesday preceding 3d Thurs.; Chicago.
INDIANAPOLIS RY. AND MECH'L CLUB.—B. S. Downey, C., H. & D., Indianapolis, Ind.
INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York; next convention, Omaha, Neb.
INTERNAT'L RY. FUEL ASS'N.—D. B. Sebastian, La Salle St. Station, Chicago; May 15-18; Chattanooga, Tenn.
INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.
INT. RY. MASTER BLACKSMITHS' ASS'N.—A. L. Woodworth, Lima, Ohio.
INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.
IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
MASTER CAR BUILDERS' ASS'N.—J. W. Taylor, Old Colony Bldg., Chicago.
MASTER CAR AND LOCO. PAINTERS' ASS'N OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass.
NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept.; Boston.
NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
NORTH-WEST RAILWAY CLUB.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., except June, July, August; St. Paul and Minn.
NORTHERN RAILWAY CLUB.—C. L. Kennedy, C., M. & St. P.; 4th Saturday; Duluth.
OMAHA RAILWAY CLUB.—A. H. Christiansen, Barker Blk.; Second Wed.
RAILWAY CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City; 3d Friday in month; Kansas City.
RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.
RAILWAY S'KEEPERS' ASS'N.—J. P. Murphy, Box C, Collinwood, O.; annual, May, 1911.
RICHMOND RAILROAD CLUB.—F. O. Robinson; 2d Monday; Richmond.
ROADMASTERS' AND MAINTENANCE OF WAY ASS'N.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Oct., 1911; St. Louis.
ST. LOUIS RAILMAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago.
SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. R. Ry., Montgomery, Ala.
SOUTHERN & SOUTHWESTREN R.R. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs.; Jan., Mar., July, Sept. and Nov.; Atlanta.
TOLEDO TRANSPORTATION CLUB.—L. G. Macomber, Woolson Spice Co., Toledo; 1st Sat.; annual, May 6, 1911; Toledo.
TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; 1st Sat. after 1st Wed.; annual, Dec. 13; Buffalo.
TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August; New York.
TRAFFIC CLUB OF PITTSBURGH.—T. J. Walters, Oliver Building, Pittsburgh; meetings monthly; Pittsburgh.
TRAIN DESPATCHERS' ASS'N OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 20, 1911; Baltimore.
TRAVELING ENG'RS' ASS'N.—W. O. Thompson, N. Y. C. & H. R.. E. Buffalo.
WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg; 2d Monday, except June, July and August; Winnipeg.
WOOD PRESERVERS' ASS'N.—F. J. Angier, First National Bank Bldg., Chicago; annual, Jan. 17-19; Chicago.

Traffic News.

The advances in coal rates from Illinois and Indiana mines which were to go into effect November 1 have been postponed to December 1.

The car shortage at the Indiana coal mines has become so great that appeals for relief are coming to the State railway commission daily.

The Northern Pacific's exhibit car, which advertises the agriculture and other resources of the northwestern states by carrying a complete (though condensed) agricultural fair to hundreds of points through the country, has just started on a 10,000 mile tour through the eastern states.

At a meeting of officers of the lines entering St. Louis on October 25, it was decided to finally refuse the demand of the arbitrary abolition committee, composed of representatives of the city council and of certain shippers of St. Louis, that the bridge differentials between East St. Louis and St. Louis shall be abolished.

An estimate is published, coming apparently from an officer of the road, in which it is said that the Long Island now carries 12,000 suburban passengers daily to and from its new terminus at the Pennsylvania station, Seventh avenue, New York City. From the same estimate it appears that the traffic of the Long Island ferry boats across the East river has decreased about 35 per cent.

Apparently with a view to making sure that the Interstate Commerce Commission shall not go out of business for lack of work, the New York Produce Exchange is going to file a petition asking for an investigation of the question of differentials on freights to and from the West, which, it is claimed, favor Philadelphia and Baltimore at the expense of New York. This question is only about 28 years old.

The Western Trunk Line roads, through their joint agent, W. H. Hosmer, have filed notice with the Interstate Commerce Commission of cancellation effective December 1, 1910, of the reduced proportional rates from Chicago and Mississippi river points to points on the Missouri river on through traffic from Atlantic Seaboard points, which reduced rates were prescribed by the commission in the Burnham-Hanna-Munger case in which the decision of the commission was recently confirmed by the Supreme Court of the United States. These reduced rates went into effect October 26, 1910, so that the commission's order, limited to two years (as required by law), is now expiring.

Bankers in New York seem to think that the controversy concerning bills of lading on cotton, which has caused much discussion for several months past, has come to an end. They believe that the English bankers will no longer insist on the severe conditions that they have been proposing. The project to form an insurance company or association to guarantee the genuineness of bills of lading appears to have made little or no progress, and the present hopes for peace appear to be based largely on the idea that the guarantees which the railways of the Southern States are now giving, and which in Texas are required by a law of the State, will afford reasonable security against fraud.

The Boston & Maine has issued its new milk tariffs for interstate traffic, in accordance with President Mellen's agreement, to go into effect Nov. 29. Lessees of milk cars will accept single can shipments from farmers at the regular can rates, plus one-half cent per can for care and icing. On an 8½-quart can the rate by passenger train is 2 cents up to 20 miles, 3 cents up to 40 miles, 4 cents up to 60 miles, 5 cents up to 100 miles and 6 cents per can for more than that distance. Icing must be done by the shipper. The B. & M. carries to Boston 65,000,000 quarts of milk per year, 80 per cent. of which is interstate. About one-half of the milk is carried on freight trains, on which the rates are about 25 per cent. less than the passenger train rate.

The New Brunswick Board of Trade and other organizations in New Jersey have complained to the Interstate Commerce Commission against the passenger rates which have been announced by the Pennsylvania Railroad to and from its new station in New York City, which are to be considerably higher than those to the company's present terminals (at the ferry landings) in New York. The distance from New Jersey points to the new station is 1.4 miles greater than to the old terminals. The railway company has announced that when the new station at Thirty-second street is opened the ferry from the railway station in Jersey City to the landing at Twenty-third street, Manhattan, will be discontinued, as will also the ferry from the Jersey City station direct to Brooklyn.

The Boise (Idaho) Commercial Club has adopted resolutions favoring the creation of a state railway commission and the Club of Commerce of Idaho Falls, Idaho, which is the second largest city in the state, has adopted resolutions opposing the creation of a state commission. The resolutions of the latter club call attention to the fact that only 8 per cent. of the total railway business in the state is intrastate, and that if a commission were created it would cost $30,000 a year. The resolutions further call attention to the fact that the Oregon Short Line has spent $20,000,000 in ten years in improving its facilities and extending its lines; that the Club of Commerce desires to encourage this policy, and that it believes a railway commission would probably interfere with its continuance.

The Southern Railway announces that on November 27, when its New York passengers will begin to be carried to and from the new Pennsylvania station at Seventh avenue and Thirty-second street in that city, there will be added a new train, to be called the "Southern's Southeastern Limited." This train will run between New York and Jacksonville, and south of Charlotte it will take the place of the New York and Florida Limited. The new train will leave New York at 12.38 p.m., and returning will leave Jacksonville at 9 a.m. On the same day the Southern will put on a new night train between Atlanta and Jacksonville which will accommodate local travel, and the Florida Limited, between Chattanooga and Jacksonville, will be devoted to through business. With the same time-table the regular winter train between Cincinnati and Jacksonville, the Florida Special, will be put on.

According to a press despatch from Washington, the Interstate Commerce Commission will decide the New England demurrage cases in accordance with a compromise which has been agreed upon, at the instance of the commission, between the railways and the complainants. The reduction of free time from 96 hours to 48 hours, which was decided upon by the railways, is to be approved except in the case of lumber, coal and grain, on which the free time for the next six months is to be 72 hours. A demurrage bureau is to be maintained at Boston to see to the proper administration of the new roads. The despatch says: Both sides agreed to let the rules go into effect December 1. The bureau, apparently, is to be established by the commission, for a term of six months. At the end of the six months the case may be reopened for argument before the commission for a final decision.

W. R. Stubbs, governor of Kansas, recently issued a statement in which he asserted that the increase in rates on live stock which the western railways propose to make would cost the people of Kansas alone a million dollars a year. Replying to this, J. R. Koontz, general freight agent of the Atchison, Topeka & Santa Fe, calls attention to the fact that the only rates in question are those between Kansas City and other Missouri river points and St. Louis, that the total number of cars of live stock hauled from Kansas City to St. Louis in the year ending June 30, 1909, was 29,097, and that if all of them had moved out of Kansas the total increase in freight rates to be paid by the people of Kansas would be only $170,217. But as a matter of fact not over 40 per cent. of the shipments originated in Kansas, so that the increase in freight charges to the Kansas shipper would be $68,000 instead of $1,000,000, as estimated by the governor.

The State Railroad Commission of Alabama has issued a letter of advice to shippers reminding them that if they desire to promote promptness and economy in transportation, they should co-operate with carriers in making cars do the greatest possible service. In other words, they should load cars to their full capacity, in the least practicable time, and see that they are unloaded promptly at destination. If the railways are obliged to pursue wasteful practices in the use of cars they must buy more cars; and the public will have to pay the interest on the value of these additional cars. The *Wall Street Journal*, commenting on this order, says: "The stand of the Alabama commission is commended to the corresponding tribunals of Oklahoma, Texas and others in which the shipping

public has over-emphasized its rights and ignored its duties. In fact, the better education of the shipper is the solution of many of the problems which affect the earning power of railways."

Chairman Knapp, of the Interstate Commerce Commission, replying to a complaining letter received from Congressman Levy, of New York, recently, said that the members of the Interstate Commerce Commission had conducted their work with due diligence and had taken only reasonable vacations; and any delay in the rate increase cases now before the commission has been ordered at the request of either the complainant or the carriers. The Washington correspondent of the New York *Journal of Commerce*, who frequently criticizes the commission, though in such mild and guarded language that it is doubtful if the criticisms count, says that the chairman has not made out his case. The commission has been overloaded with work for the last four years and done some of its tasks hastily, thus making it necessary to go over some matters a second time. The commission is not likely now to catch up with its docket, no matter how hard it may work, especially as "some members of the commission have not always worked very hard." The recent promotion of law clerks and others in the Washington office to the position of examiner is criticized as unsatisfactory, on the ground that these examiners have not proved to be very efficient. Moreover, "the commission has not been willing to give them the authority that was necessary in order to make them really effective in the work. * * The attempt to reorganize the service may fairly be said to have been unsuccessful and the commission remains overloaded with a multitude of executive and judicial duties confused with one another and impossible to classify or parcel out." This correspondent thinks that the work of the commission has been considerably discredited by reversals of its opinions in the courts. In 1906 and 1907 the commission's decisions appeared to fare well in the courts, but since then the tide has turned the other way.

Rate Advance Hearings at Chicago.

In the rate advance hearings at Chicago, while witnesses for the shippers testified that the railways formerly gave large rebates and that since they have quit giving rebates they ought to be able to get along with present rates, they positively refused, under cross-examination of the lawyers for the railways, to give any specific instances of rebating. The railway lawyers sought to get them to tell what railways had given the alleged rebates, the amounts, and, particularly, what shippers had received them.

E. J. McVann, traffic manager of the Omaha chamber of commerce, undertook to show that the estimated value of $3,000,000 placed on the Burlington's terminals at Omaha by its general manager, F. E. Ward, was excessive. He introduced a statement to show that the terminals are worth less than $1,000,000. Cross-examination by counsel for the railways brought out the fact that Mr. McVann in making his estimate had overlooked a very large part of the Burlington's Omaha terminals, including those in South Omaha.

J. R. White, traffic manager of the Burnham-Hanna-Munger Dry Goods Company, of Kansas City, Mo., testified that his concern formerly had received rebates amounting to 30 to 40 cents per 100 lbs. from the first-class rate of $1.47 from the Atlantic seaboard to the Missouri river.

The star witness for the shippers was Governor W. R. Stubbs, of Kansas. Mr. Stubbs was, before he entered politics, engaged in the contracting business on an extensive scale, and, among other kinds of work, took a good many contracts for building railway lines. He produced an estimate which he said was based on his experience and on a personal investigation as to the amounts the railways now pay for labor and supplies, and he said that he could reproduce the main lines of the railways in Kansas for $25,000 a mile and the branch lines for $15,000 a mile. He gave detailed figures regarding the costs of rails, ties, grading, etc., his figures being as follows:

Rails, 80-lb., 140 tons per mile	$4,200
Splicing, bolts, spikes, etc.	400
Ties	2,500
Grading	5,000
Track laying	600
Bridges, depots, roundhouses, right of way	6,000
Ballast	4,000
Incidentals, freight, etc.	2,300

On cross-examination, the attorneys for the railways brought out the fact that this included no expenditures for the purchase of right-of-way, terminals or equipment. Governor Stubbs contended that enough land for the construction of railways would be given free, and estimated that if it were not it would cost only $2,000 a mile. He estimated the cost of equipment at $5,000 a mile. He said that a few years ago he had offered to build a road from Belleville, Kan., to Wichita, a distance of 150 miles, for $16,000 a mile, but that a combination of railways had prevented this construction from being done.

General Attorney Norton, of the Santa Fe, put in a statement showing that the Santa Fe had recently spent on a line in New Mexico the following amounts for the exact items mentioned by Mr. Stubbs under conditions somewhat similar to those existing in Kansas:

Rails, 80-lb., 140 tons per mile	$4,685
Splicing, bolts, spikes, etc.	818
Ties	2,520
Grading	11,250
Track laying	1,684
Bridges, depots, roundhouses, right-of-way	8,779
Ballast	1,415
Incidentals, freight, etc.	9,694

These items foot up to $40,845 a mile. The governor admitted that it would cost an average of $5,000 a mile to equip the road, and the addition of this figure and of $2,000 for right-of-way would bring the Santa Fe's figures up to $47,845 a mile. This includes no allowance for signaling or terminals.

The governor said that 20 years ago the railways hauled only 15 or 20 cars in a train and the cars were of much smaller capacity than at present. Commissioner Lane interposed the suggestion that at that time the railways were in the hands of receivers. Mr. Stubbs retorted that that was due to financial manipulation and not to inability of the roads to earn enough money to make proper additions to and improvements in their lines. He said that J. P. Morgan, James J. Hill and the other big financial men of the country are the people who have the money and to say that they cannot lend it to themselves is absurd. Governor Stubbs contended strongly that a valuation of railways should be made, based on the amount that it had actually cost to construct them, and they should then be allowed a "generous" return on the valuation. Asked what he considered a generous return, he said 5 or 6 per cent. Being asked which rate he meant (5 or 6), he said that probably the western roads should be allowed 6 per cent. and the eastern roads 5 per cent.

John Barton Payne, who conducted most of the cross-examination for the railways, questioned the governor regarding his motives for appearing as a witness for the shippers, and he said he appeared to protect the people of Kansas from extortionate freight rates. The railway lawyers found it impossible to pin him down to direct answers to their questions. Every time a question was asked he would get on his feet and address a stump speech to the crowd attending the hearing. Finally Mr. Payne said: "Governor, I suppose you expect your stump speeches here to be wired to the Kansas newspapers, and that you think that to deliver them here will do you as much good as if you made them in Kansas." Quick as a flash the governor replied: "I hope my speeches will be telegraphed to Kansas, and I am sure they will do me just as much good when delivered here as if delivered there."

Mr. Norton, of the Santa Fe, for the purpose of showing the reasons for the governor's appearance as a witness, read into the record a telegram from J. H. Atwood, attorney for the shippers, appealing to Governor Stubbs to come to Chicago. The telegram stated that the case of the shippers was in a bad way and that unless he came to the rescue of the people of the Middle West and did something to stir up public sentiment rates would probably be advanced.

Governor Stubbs vigorously attacked railway methods of financiering, and said that if the farms of Kansas were run like the railways, "bonded for more than they cost and employed high-salaried officers," they would all be "busted" in a year. He declared it ridiculous for a railway to talk about poor credit; if the railways would stop their high financiering they could get more money from the American people than they could use. The curse of American railways, he said, is the way they have juggled things and the way their officers have gotten rich in shady deals.

When his attention was called to the fact that large amounts of money had been lost in early investments in railways, he replied that may be the people who put money in them had lost it, but that the New York promoters had enriched themselves by bringing financial difficulties on the roads, and, in consequence, are now "too rich to be comfortable."

Governor Stubbs' purpose in appearing as a witness in the rate case is perhaps indicated by the fact that he brought with him a press agent from Topeka, Kan., and on the night before he was called to testify gave to the newspapers a statement of what he proposed to say.

After the shippers closed their testimony witnesses were called by the railways to justify the advances in the specific rates which it is proposed to make.

C. G. Burnham, vice-president in charge of traffic of the Burlington, in answer to statements of witnesses for the shippers that earnings had been greatly increased by the abolition of rebates as well as by advances in the published tariffs, introduced detailed tables giving present rates, proposed advances and those which were in effect in 1900 and 1905. The tables showed that the rates on some commodities have been advanced but that on more commodities they have been reduced, and that, in consequence, the average rate is lower now than it was in 1905 and that it is considerably lower than it was in 1900. Mr. Burnham showed that on the tonnage of September, 1909, and March, 1910, earnings would have been $17,061 less under the proposed higher rates than they would have been under the rates in effect in 1900.

The following figures give the average of the commodity rates in effect in the past, in effect now and which it is proposed to put in effect: From Chicago to the Missouri river: In 1900, 31⅓ cents; in 1905, 26.9 cents; present average, 23½ cents; proposed average, 26.8 cents. From Chicago to St. Paul: In 1900, 25⅓ cents; in 1905, 22⅛ cents; present average, 19 cents; proposed average, 22⅞ cents.

Commissioner Lane suggested that the answer to these questions would be that the roads did not get their full rates in 1900. Mr. Burnham replied that his tables showed the ton-mile rates based on the actual freight receipts after the rebates had been deducted, and, therefore, indicated what the actual earnings were and would be. He added that the amount of rebates that the railways had given had been greatly exaggerated. He had never known any case where a rebate of over 30 per cent. had been given, and did not believe the rebates given by the Burlington would aggregate over 3 to 5 per cent. of the road's total freight earnings. There was similarly a very exaggerated view prevalent, he said, as to the amount of free transportation that formerly was given. The Burlington's records show that only 1.9 per cent. of the passengers formerly carried were hauled on free transportation. He added that rebates were not given on many of the commodities under consideration. The traffic manager of the Burnham, Hanna, Munger Dry Goods Company, of Kansas City, having testified that his company had received a rebate of 49 per cent. from the through rate from the Atlantic seaboard to the Missouri river, Mr. Burnham stated that this company had received the largest rebates of any company on the Missouri river.

In regard to the reasons for the proposed advances, Mr. Burnham said that the reports which had come to the officers of the roads had shown constant increases in gross earnings, stationary or decreasing net earnings, and continually declining average rates per ton per mile and per passenger per mile. They also indicated that economies effected by increased loading per car and by the use of heavier trains had ceased. It was concluded, therefore, that if the property was to be properly maintained and operated, it was necessary to get higher rates. He said the advances announced and the further advances considered would not give the Burlington anything like the additional revenue that it requires, but he believed that as a practical matter it would not be possible for the railways to make as large advances as they would like to. The roads, however, intend to make some advances in addition to those already proposed. The advances already proposed by the Burlington would yield it $400,000 a year, and it was felt that other advances which would run this increase up to $800,000 a year should be made. He did not believe it would be practicable to make any further advances.

Attorney Lyon, of the commission, asked Mr. Burnham if his road would have asked for an advance in rates if it had foreseen that its net earnings would be larger in the fiscal year 1910 than they were in the year 1909. He replied in the affirmative, because the increase in net earnings, he said, represented unusual economy. He explained that the commodity rates were selected for advances because they were disproportionately low. He believed that the class rates ought to be raised. For example, if the commodity rates should be advanced 15 per cent., class rates ought to be advanced about 10 per cent., but he doubted if, as a practical matter, class rates could be raised. He said that in deciding on the increases proposed the roads had taken into consideration the value of the articles, the cost of transportation, the tonnage of the various commodities, the increases in their selling prices in recent years, the effect on the rates from Chicago to St. Paul of the competition of the water lines from Chicago to Duluth, the profits of the shippers as compared with those of the railways, and numerous other factors.

Commissioner Lane asked whether the roads, when the commission had reduced some rates, looked around for other rates to increase, and whether they consider that they have a right, when the commission reduces some rates, to increase others. Mr. Burnham replied that the roads assume that they have a right to earn a fair return, and that if reductions made by the commission will prevent them from doing this, they have a right to advance other rates which the commission has not fixed.

S. H. Johnson, assistant freight traffic manager of the Rock Island, said that the proposed rate advances affect 12.23 per cent. of the tonnage of his road, and that, excepting grain and coal, none of the commodities which move in large quantities or that are necessities of life, are affected. Commissioner Lane remarked that until recent federal legislation was passed the roads could advance any rates they liked, and he asked why the advances had been made since the commission was given supervision of rates. Mr. Johnson replied that there was a conflict between the regulation of state and interstate rates that has helped to produce this condition; that the state commissions have not only made unwarranted reductions in rates, but have made harmful adjustments. Mr. Lane asked if the roads had taken proper steps to get the state rates on what they consider a proper basis. Mr. Johnson answered that they were litigating the rates in many states, citing cases which are pending in the federal courts in Oklahoma, Arkansas, Missouri and Minnesota. He said the roads could get along very well with the Interstate Commerce Commission if they did not have to deal with all the state commissions at the same time. Mr. Johnson was questioned at length by attorneys for both the railways and the shippers regarding his opinion of what constitutes a reasonable rate. He said that a reasonable schedule of rates was one that would enable a road to earn at least a fair return, but that as to the particular rates in question he thought they should be raised whether the railways receiving them were earning more or less than a fair return, as they are unfairly low as compared with other rates. An interesting colloquy took place between the witness, the lawyers for both the shippers and the railways and Commissioners Clark and Lane, when Mr. Johnson said he thought that rates should be based largely on the value of the service. The discussion showed that varying views are held as to the extent that value of the service should be considered in rate-making by the representatives of the railways and that they do not even agree very well as to what the term itself means.

James S. Peabody, statistician of the Santa Fe, testified that the handling of intrastate traffic costs the roads from two to five times as much as the handling of interstate traffic, and criticized the attempts independently to regulate state and interstate rates as an absurdity.

Revenues and Expenses of Railways.

The accompanying index gives the numbers of the page in volumes 47, 48 and 49 of the *Railway Age Gazette* on which the revenues and expenses of each railway reporting to the Interstate Commerce Commission is given for each month in the fiscal year ended June 30, 1910. On the following page there is given the earnings and expenses of roads whose monthly returns for the indicated months have not before appeared in the *Railway Age Gazette*. No trouble should be experienced in telling which volume the page numbers of the index refer

to. For instance, the figures 560, 771, 983 and 1317 for the Alabama & Vicksburg evidently refer to pages in volume 47; and the numbers from 202 to 1808 refer to volume 48, and from 202 to 258, volume 49.

PAGE-INDEX TO REVENUES AND EXPENSES OF RAILWAYS FOR THE FISCAL YEAR ENDED JUNE 30, 1910,

Name of Road.	1909.						1910.					
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
Alab. & Vicksb'rg.	560	771	983	1317	202	270	911	1059	1178	1808	202	258
Alab. Gt. South.	560	771	983	1254	158	373	911	1059	1275	1808	170	368
Ann Arbor	560	771	983	1254	202	422	844	1106	1318	56	202	368
Ariz. & New Mex.	605	...	1101	....	...	270	...	....	....	....	...	434
Ariz. Eastern			....	....	....	...	...	1106	1318	56	202	*
Atch., T. & S. F.	517	720	889	1161	64	325	542	965	1225	1430	99	290
Atlanta & W. Pt.		...	1101	....	...	...	...	....	1383	....	...	434
Atlanta, B. & A.	517	...	938	1208	107	373	747	1010	1318	1562	...	326
Atlantic & St. L.	605	...	1101	....	202	457	911	1106	1318	56	202	368
Atlantic City	560	821	1 33	....	...	457	...	....	1383	....	202	*
Atlantic C. Line.	517	652	889	1161	64	325	542	965	1225	1430	99	258
Baltimore & O.	517	652	938	1161	107	373	542	1010	1225	1562	139	290
Bangor & Aroos.	517	652	889	1208	107	270	747	965	1178	1562	170	258
Belt Ry. Co. of C.	605	821	1033	....	...	457	...	....	1383	....	...	434
Bessemer & L. E.	560	771	889	1254	107	270	911	...	1178	1808	170	326
Birm. & South.			....	....	....	...	...	....	....	....	...	434
Boston & Maine.	517	652	938	1161	64	325	542	965	1225	1430	139	326
Buffalo & Susque.	560	771	889	1254	158	422	844	1106	1318	56	*	*
Buffalo, R. & Pgh.	517	720	889	1208	107	270	747	965	1275	1562	99	290
Butte, A. & Pac.	560	821	1101	....	...	457	...	....	1383	....	...	434
Can. Pac. in Me.	605	...	....	....	....	422	911	1106	1318	56	...	368
Carolina, C. & O.	560	...	1101	....	...	457	911	1106	1318	....	202	258
Central New Eng.	560	652	983	1317	158	270	911	1106	1178	1808	202	368
Central of Ga.	517	652	889	1208	158	325	747	965	1225	1562	170	368
Central of N. J.	517	652	889	1161	107	325	844	1010	1178	1430	139	*
Central Vermont.	560	771	1033	1254	158	457	844	1059	1275	56	202	*
Charles. & W. Car.	560	821	1033	1317	202	422	844	1106	1318	56	202	258
Chesapeake & O.	517	652	938	1161	64	325	542	965	1225	1430	99	326
Chicago & Alton.	517	771	1033	1254	158	422	844	1059	1275	1808	139	326
Chicago & E. Ill.	517	652	938	1254	64	270	542	965	1275	1430	139	290
Chicago & Erie	560	652	889	1254	158	422	844	1059	1275	1808	170	290
Chic. & N. West.	517	652	889	1161	64	325	542	965	1178	1430	99	258
Chic., Burl. & Q.	517	652	889	1161	64	325	542	965	1225	1430	139	434
Chic., Cin. & L.	560	821	983	1317	202	422	844	1106	1178	56	170	326
Chicago Gt. West.	517	821	1033	1208	107	270	747	965	1178	1430	99	*
Chic., Ind. & S.	560	771	983	1254	158	373	911	1059	1275	1808	170	290
Chic., Ind. & L.	517	720	983	1208	107	373	747	1010	1275	1808	139	434
Chic., Mil. & P. S.		...	1101	1208	158	325	747	1010	1275	1808	139	326
Chic., Mil. & St. P.	517	821	1033	1208	158	325	747	1010	1275	1808	139	326
Chic., P. & St. L.	560	652	1033	1317	202	422	844	1106	1178	....	202	*
Chic., R. I. & El P.	560	...	....	....	....	...	....	....	....	....	...	326
Chic., R. I. & Gulf.	560	720	938	1254	107	373	911	1010	1178	1562	170	290
Chic., R. I. & Pac.	517	720	938	1161	64	325	542	965	1225	1430	99	326
C., St. P., M. & O.	517	720	889	1161	64	270	747	965	1178	1430	99	258
Cin. & Musk. Val.	560	...	1101	....	...	...	...	....	1383	....	...	258
Cin., H. & D.	560	771	983	1161	107	270	747	965	1225	1430	99	290
C., N. O. & T. P.	560	771	983	1254	158	373	844	1059	1275	1808	170	368
Cincinnati North.	560	771	983	1317	202	457	...	....	1318	....	...	290
Cleve., A. & C.	560	821	983	1317	158	457	911	1059	1383	....	202	258
C., C., C. & St. L.	517	720	983	1161	107	373	542	1010	1275	1562	139	290
Cleve. Term. & V.	560	...	....	....	202	457	...	....	1383	....	...	434
Coal & Coke	605	...	....	....	...	270	...	....	....	....	...	*
Colo. & Southern.	517	720	889	1161	64	270	542	965	1178	1430	99	368
Colo. & Wyoming.	605	...	....	....	....	...	....	....	....	....	...	434
Colo. Midland.	560	771	983	1254	158	422	844	1106	1178	56	170	*
Cumb. & Penna.	605	...	....	....	....	...	....	....	....	....	...	434
Cumberland Val.	560	...	.*.	1317	158	270	911	1059	1178	1808	202	258
D. & H. Co.	517	720	938	1161	64	325	542	1010	1225	1430	99	258
D. L. & W.	517	652	938	1161	64	270	542	965	1178	1430	99	258
Denver & Rio G.	517	720	938	1208	107	373	542	1010	1225	1430	139	290
Denver, N. & Pac.	605	...	1101	....	...	...	...	....	....	....	...	434
Detroit & Mack.	560	821	1033	1317	...	270	...	....	1178	56	202	258
D. & T. Shore L.	605	...	....	....	....	...	....	....	....	....	...	434
D., Gr. H. & Mil.	605	771	1033	1317	202	457	911	1106	1318	56	202	368
D., Tol. & Ironton.	560	771	983	1254	202	422	844	1106	1318	56	202	326
Duluth & I. R.	560	821	938	1254	158	422	...	....	1383	1808	170	258
Duluth, M. & N.	560	821	889	....	158	422	...	....	1178	1808	170	258
Duluth, S. S. & A.	560	821	983	1254	158	422	844	....	1383	1562	170	326
East. Ry. Co., N.M.	605	...	1101	1317	...	457	...	....	1383	....	...	434
El Paso & S. Co.	517	720	938	1208	64	325	747	965	1178	1562	99	258
Elgin, Joliet & E.	517	652	889	1208	107	325	844	1010	1275	1562	170	258
Erie	517	652	889	1161	64	325	542	965	1225	1430	99	290
Evansville & T. H.	560	821	983	....	158	270	911	1106	1383	56	170	258
Florida East Coast.	517	652	889	1254	107	373	747	1059	1275	1562	99	326
Fonda, J. & G.	605	...	....	....	....	...	....	....	....	....	...	434
Fort Smith & W.	605	...	1101	....	....	...	....	....	....	....	...	*
Ft. Worth & D. C.	517	652	889	1254	107	270	844	1106	1275	1808	170	326
Ft. Worth & Rio G.	605	...	1101	....	...	270	...	....	....	....	...	434
Galv., H. & S. A.	517	720	938	1208	158	373	747	1010	1275	1562	139	326
Georgia		...	1101	1317	158	422	844	1059	1318	56	202	*
Georgia & Flor.	605	...	....	....	....	...	....	....	....	....	...	*
Ga., Fla. & Ala.	605	...	....	....	....	...	....	....	....	....	...	*
Georgia S. & Fla.	560	771	....	1317	158	422	911	1059	1318	56	170	368
Grand Rap. & Ind.	517	652	889	1208	107	373	911	1010	1275	1562	99	258
Grand Trunk W.	605	771	983	1254	202	457	844	1106	1318	56	170	368
Great Northern.	517	720	938	1161	64	325	542	965	1275	1430	99	290
Green Bay & West.	605	...	....	....	....	...	....	....	....	....	...	*
Gulf & Ship Is.	560	652	1033	1317	158	270	844	1106	1178	56	202	368
Gulf, Colo. & S. F.	517	720	889	1161	64	325	542	965	1178	1430	99	326
Hocking Valley.	560	771	889	1254	107	422	844	1059	1178	56	170	368
Houston & Tex. C.	517	771	938	1208	107	373	844	1010	1275	56	170	326
Hous. E. & W. T.	560	821	1101	....	...	457	...	....	1383	....	202	326
Illinois Central.	517	720	938	1161	64	325	542	1010	1225	1562	139	368
Ind. Harbor Belt.	605	821	1033	....	...	457	...	....	1383	....	...	434
Ind'apolis South.	560	...	1101	....	...	...	...	....	....	....	...	368
Intern'l & Gt. N.	560	720	1101	1317	202	373	747	1010	1275	1562	170	434
Iowa Central.	517	771	983	1254	202	422	844	1059	1275	1808	139	326
Kanawha & Mich.	560	771	983	1254	158	422	911	1059	1178	56	170	368
Kan. C., M. & O.	*	*	*	*	*	*	*	*	*	*	*	*
Kan. City South.	517	652	889	1161	64	270	747	965	1178	1430	99	258
Lake Erie & W.	517	720	983	1208	107	373	747	1010	1275	1562	139	290
Lake S. & Mich. S.	517	720	983	1161	107	373	542	1010	1275	1562	139	290
Lehigh & Hud. R.	560	821	1033	....	...	457	...	....	1383	....	...	434
Lehigh & N. Eng.	560	...	1101	....	...	...	...	....	....	....	...	434
Lehigh Valley.		652	889	1161	64	270	542	965	1178	1430	99	368
Long Island.		...	....	1208	158	373	747	1059	1275	1562	99	290
Louisiana & Ark.	560	821	1033	....	...	422	...	1106	1318	56	202	258
Louis. R. & N. Co.	560	821	1033	1317	202	422	911	1106	1318	56	170	368
Louisiana West.	560	821	983	1317	...	422	911	1059	1318	56	202	326
Louisville & Nash.	517	652	889	1161	107	325	542	965	1225	1430	99	368
L'ville, H. & St. L.	560	...	1033	....	...	457	...	....	1318	....	...	258
Maine Central.	517	720	889	1208	107	270	747	965	1178	1430	99	258
Michigan Central.	517	720	983	1208	107	457	542	1010	1275	1562	139	290
Midland Valley.	560	652	1033	1317	202	270	844	1106	1178	56	...	258
Min'apolis & St. L.	517	771	....	1254	202	422	844	1059	1275	1808	139	326
M. St.P. & S.S. M.		...	....	....	....	...	457	911	1106	1318	1808	...
Miss. Central.	605	...	....	....	....	270	...	....	....	....	....	434
Miss. Riv. & B. T.	605	...	....	....	....	...	...	....	....	....	...	434
Missouri & N. Ark.	605	...	1101	....	....	...	...	....	1178	....	...	434
Missouri, K. & T.	517	652	938	1161	64	325	542	965	1178	1430	99	290
Missouri Pacific.		...	983	....	202	422	911	1059	1318	1808	*	*
Mobile & Ohio.	560	821	938	1208	107	325	747	965	1225	1430	139	290
M., J. & K. C.	560	821	1033	1317	202	...	...	....	....	....	....	...
Monongahela	605	...	1101	....	....	...	...	....	1383	....	...	434
Monon. Connect.	605	...	1101	....	....	...	...	....	....	....	...	434
Morgans La. & Tex. R. R. & S. S. Co.	560	771	983	1254	158	373	844	1059	1318	56	202	326
Nash., C. & St. L.	560	720	938	1208	64	325	747	1059	1225	1562	139	326
Nevada Northern.		...	....	....	....	457	...	1106	1383	56	...	*
New Orleans & N.	560	771	983	1317	202	270	911	1059	1178	1808	202	258
N. Orleans Gt. N.	560	821	1033	....	202	270	911	1106	1178	56	202	*
N. Or., M. & C.		...	....	....	....	...	844	1106	1318	56	170	*
N. Y. C. & H. R.	517	720	983	1161	107	373	542	1010	1275	1562	139	290
N. Y., C. & St. L.	517	720	889	1208	107	373	747	1010	1225	1562	139	326
N. Y., N. H. & H.	517	652	889	1161	64	270	542	965	1178	1430	99	368
N. Y., O. & W.	517	652	938	1208	64	422	747	1010	1178	1562	99	290
N. Y., Phila. & N.		...	....	1317	158	457	911	1059	1383	1808	202	258
N. Y., S. & W.	560	821	983	1317	158	422	911	1059	1318	1808	202	326
Norfolk Southern.	517	771	889	1254	107	270	747	1010	1178	....	99	326
Norfolk & West.	517	652	889	1161	64	325	542	965	1225	1562	99	258
Northern Central.		...	....	1208	64	325	747	1010	1225	1562	99	258
Northern Pacific.	517	652	889	1161	107	422	747	1010	1225	1430	99	368
Northwestern Pac.	560	771	1033	1254	158	373	844	1059	1318	1808	170	326
Ore. R.R. & N. Co.	517	720	938	1208	107	373	844	1106	1225	1562	170	290
Ore. Short Line.	517	720	938	1208	64	373	747	1010	1225	1562	139	290
Oregon & Wash.		...	....	....	....	...	...	....	....	....	202	*
Pecos & No. Tex.	605	821	1033	1317	202	457	911	....	1383	....	202	434
Pennsylvania Co.	517	652	889	1161	64	325	542	965	1225	1430	99	258
Pennsylvania R. R.		...	....	1161	64	325	542	965	1225	1430	99	258
Peoria & Eastern.	560	771	983	1254	158	373	911	1059	1275	1808	170	290
Peoria & Pekin U.	605	...	....	....	....	...	...	....	....	....	...	434
Pere Marquette.	517	720	938	1161	64	270	542	965	1178	1430	99	290
Phila. & Reading.	517	720	983	1208	107	325	747	1010	1225	1562	170	*
Phila., B. & W.		...	....	1208	64	325	542	965	1225	1430	99	258
P. & L. E.	560	771	983	1254	107	373	911	1059	1275	1808	139	290
P., C., C. & St. L.	517	652	889	1161	64	325	542	965	1225	1430	99	258
P., S. & N.	560	...	1101	1317	...	422	...	....	1318	....	202	368
Port Reading.	605	...	....	....	....	...	...	....	1383	....	...	*
Q., O. & K. C.	605	...	1101	....	....	...	...	....	....	....	...	434
R., F. & P.	605	821	1033	1317	...	457	...	....	1383	56	202	368
Rutland	517	771	983	1254	107	373	911	1059	1275	1808	139	290
St. Jos. & Gr. Is.	560	652	938	1317	202	422	844	1106	1318	56	202	326
St. Louis & San F.	517	720	938	1254	158	325	542	1010	1225	1562	139	326
St. Louis, B. & M.	560	821	1101	1254	202	422	844	1106	1383	56	170	368
St. L., I. Mtn. & S.		...	983	....	202	422	911	1059	1318	1808	*	*
St. L. M. B. Term.	605	821	1033	....	...	457	...	....	1383	....	...	434
St. L., San F. & T.	605	...	1101	....	....	270	...	....	....	....	...	434
St. L. Southwest.	517	720	938	1208	158	325	747	1010	1225	1562	139	326
St. L. S. of Tex.	517	720	938	1208	158	325	747	1010	1225	1562	139	326
San A. & A. Pass.	517	771	889	1208	202	373	911	1010	1383	1808	170	326
San Pedro, Los Angeles & Salt L.	517	720	938	1208	202	373	747	1010	1383	1808	170	326
San. Fe, P. & P.	560	821	1033	1317	202	422	844	1106	1318	56	202	290
Seaboard Air L.	517	720	983	1254	202	373	747	1010	1275	1562	139	368
South Buffalo	605	...	....	....	....	...	...	....	....	....	...	434
Southern	517	652	938	1161	64	325	542	965	1178	1430	139	290
South. R. in Miss.	605	...	938	....	....	457	...	....	....	....	...	290
Southern Ind.	560	652	1033	1317	202	270	911	1106	1318	....	202	368
So. Kans. of Tex.	605	821	1033	1317	202	457	911	....	1383	....	202	434
So. Pac. Co.	517	720	938	1208	64	373	747	1010	1225	1562	170	326
Spok. & In. Emp.		821	1033	....	....	457	...	....	1383	....	...	*
Spokane Intern'l.	560	...	1101	....	....	457	...	....	1383	....	...	368
Spok., Port. & S.		...	1033	1317	202	422	844	1059	1318	1818	*	*
S., B. & N. Y.	560	...	1101	....	....	...	...	....	....	....	...	434
Tennessee Cent.	560	771	1033	1317	202	270	...	1106	1318	56	202	290
Term. R.R. Assn. of St. Louis.	605	821	1033	....	...	457	...	....	1383	....	...	434
Tex. & New Or.	517	720	938	1208	158	373	747	1010	1275	1562	139	326
Texas & Pac.	517	720	889	1161	64	325	542	1010	1225	1430	139	290
Texas Central.	560	...	1101	1317	202	422	911	....	1383	....	...	368
Toledo & O. Cent.	560	771	983	1254	107	373	844	1059	1275	....	170	290
Toledo, P. & W.	560	...	1033	1317	...	422	844	1106	1318	....	...	368
T., St. L. & W.	517	771	1033	1254	158	422	844	1059	1275	1808	139	326
Trinity & Braz. V.	560	821	938	1254	107	373	844	1106	1318	56	...	434
Ulster & Dela.	560	821	1101	....	...	457	...	....	1383	....	...	368
U. R.R. of Balt.		...	....	....	....	457	...	....	1383	....	...	434
U. R.R. of Pgh.	605	821	1033	....	....	270	...	....	1383	....	...	434
Union Pacific.	517	652	938	1161	158	373	542	965	1225	1430	139	258
Vandalia	517	652	889	1208	64	325	747	965	1225	1430	99	258
Vicks., S. & Pac.	560	771	983	1317	202	270	911	1059	1178	1808	202	258
Vir. & S'western.	560	...	1033	....	....	457	...	....	1383	....	...	368
Virginian	560	771	1033	1317	202	457	844	1106	1318	1808	170	290
Wabash	517	771	938	1208	107	373	747	1059	1225	1562	139	290
Wabash Pgh. T.	605	...	1101	....	....	...	...	....	....	....	...	*
Wash. Southern.	605	...	1101	....	....	457	...	....	1383	56	202	368
W. Jersey & Sea.		...	....	....	1254	158	457	911	1059	1275	1808	170
West. Maryland.	605	821	1033	1254	202	...	...	1106	1318	56	...	368
West. Ry. of Ala.		...	1101	....	....	422	...	....	1383	....	...	368
Wheeling & L. E.	517	771	889	1208	107	373	747	1059	1275	1808	170	290
Wichita Valley.	605	...	1101	....	...	270	...	....	....	....	...	*
Wisconsin Cent.		...	....	....	....	457	911	1106	1318	1808	*	*
Yazoo & Miss. V.	517	720	938	1161	64	325	542	1106	1225	1562	139	368

*Indicates returns received too late for current publication, which are published on following pages.

REVENUES AND EXPENSES OF RAILWAYS.

Delayed Returns for the Fiscal Year Ended June 30, 1910.

Name of road.		Mileage operated; end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Arizona Eastern	June	312	$117,018	$35,418	$155,508	—$38,183	$10,297	$2,502	$37,836	$4,568	$17,020	$138,488	.....	$7,465	$131,023	$102,967
	Year	.....	1,349,854	415,296	1,875,248	385,914	126,358	24,779	438,299	42,889	1,018,239	857,009	.....	68,948	788,061	239,072
Atlantic City	June	166	59,319	114,884	182,037	52,160	17,708	1,962	80,825	895	153,550	28,487	—$6,524	23,313	45,276	—43,727
	Year	.....	703,535	1,021,670	1,805,007	351,224	213,560	25,723	849,363	12,955	1,452,825	352,182	—48,144	53,687	250,350	21,461
Buffalo & Susquehanna	May	361	167,736	16,776	191,771	29,178	56,720	1,958	63,165	9,836	160,857	30,914	—30	4,000	26,884	6,377
	June	.....	175,247	17,208	200,946	29,701	48,245	2,420	62,756	7,901	151,023	49,923	—40	4,000	45,884	30,015
	Year	.....	1,910,787	217,942	2,212,436	400,034	685,507	25,844	870,140	95,219	2,076,744	135,692	—346	48,000	87,346	—202,783
Central of New Jersey	June	673	1,552,057	380,417	2,087,198	218,865	358,589	37,063	576,513	61,277	1,252,307	834,891	—269,376	97,848	467,667	—165,020
	Year	.....	18,077,081	4,464,027	23,851,511	2,109,225	3,858,863	346,674	6,450,539	503,182	13,268,483	10,583,028	—93,172	1,174,924	9,314,932	875,184
Central Vermont	June	411	220,078	90,271	330,532	41,970	72,304	10,197	108,297	7,438	240,206	90,326	1,074	10,110	81,290	—52,237
	Year	.....	2,513,000	1,022,275	3,800,957	431,651	697,288	101,145	1,545,313	86,732	2,862,129	938,828	9,069	121,393	826,504	98,481
Chicago Great Western	June	1,487	674,270	244,107	1,000,407	158,586	129,776	47,067	394,272	39,317	769,018	231,389	—7,376	49,232	174,781	.....
	10 mos.*	.....	7,279,081	2,141,972	10,171,782	1,296,438	1,244,130	422,857	4,407,301	355,649	7,726,375	2,445,407	—17,675	304,722	2,123,010	.....
Chic., Peoria & St. Louis	June	255	102,835	23,912	133,907	32,806	14,167	7,508	67,329	5,796	127,606	6,301	.....	6,385	—84	16,311
	Year	.....	1,387,355	299,366	1,766,967	278,011	331,202	80,101	732,134	63,668	1,485,117	281,850	.....	53,786	228,064	115,564
Coal & Coke	June	197	50,217	14,279	67,038	14,399	14,705	1,186	17,512	2,083	49,885	17,153	11,160	3,500	24,813	9,852
	Year	.....	557,681	160,309	747,021	127,723	199,135	11,152	201,742	26,072	565,824	181,197	110,923	42,000	250,120	69,606
Colorado Midland	June	337	127,905	37,091	186,479	30,353	26,032	9,225	68,539	5,768	139,917	46,562	702	9,335	37,929	21,487
	Year	.....	1,684,413	383,385	2,340,285	308,306	396,399	122,090	1,006,029	67,610	1,901,434	438,851	—4,955	110,419	323,477	—54,950
Fort Smith & Western	June	221	27,485	14,715	45,124	—1,401	13,968	685	16,099	2,731	32,082	13,042	36	3,165	9,913	—10,587
	Year	.....	414,182	209,463	663,085	162,260	170,865	13,618	208,879	31,343	586,965	76,120	—1,311	54,165	20,644	49,910
Georgia	June	307	116,780	66,595	196,786	—114,986	40,288	10,384	95,219	7,313	38,218	158,568	.....	3,775	154,793	111,329
	Year	.....	2,015,349	821,601	3,010,956	235,210	460,024	117,461	1,212,163	85,415	2,116,273	894,683	.....	26,669	868,014	365,272
Georgia & Florida	June	284†	23,366	15,236	40,590	5,786	8,932	2,943	15,968	4,308	37,931	2,659	.....	1,547	1,112	—867
	Year	.....	316,349	179,782	521,238	69,302	74,540	24,818	190,710	48,480	407,850	113,388	.....	17,703	95,685	24,271
Georgia, Fla. & Alabama	June	187‡	15,431	13,047	31,782	3,363	2,260	1,380	11,474	3,567	22,044	9,738	.....	1,560	8,178	11,095
	Year	.....	228,123	150,112	417,756	62,699	54,753	12,773	155,158	55,147	340,530	77,226	—2,637	18,725	55,864	11,311
Green Bay & Western	June	225	29,318	15,083	49,763	9,931	7,707	430	14,337	1,579	33,984	15,779	.....	2,952	12,827	—729
	Year	.....	396,100	157,362	609,692	101,810	80,452	5,564	184,787	25,434	398,067	211,625	.....	24,627	186,998	37,324
Kan. City, Mex. & Orient.§	July	660	99,336	34,667	139,888	29,568	26,686	4,585	56,967	4,931	122,737	17,151	.....	4,750	12,401	28,346
	Aug.	.....	101,888	37,677	145,687	26,961	21,125	3,888	49,957	5,628	107,559	38,128	.....	6,350	31,778	41,982
	Sept.	.....	83,264	34,790	123,798	26,241	20,931	3,958	48,168	6,008	105,306	18,492	.....	6,350	12,142	20,211
	Oct.	.....	113,868	39,237	159,479	27,059	18,912	5,322	61,937	6,674	119,904	39,575	.....	6,465	33,110	18,454
	Nov.	736	115,660	34,199	155,988	29,868	19,880	4,973	68,764	7,984	131,469	24,519	.....	7,465	17,054	5,315
	Dec.	.....	108,049	32,975	147,422	35,002	22,852	4,511	70,837	6,301	139,503	7,919	.....	6,465	1,454	—9,645
	Jan.	.....	96,262	32,590	135,196	34,275	26,330	5,462	67,621	7,530	141,218	—6,022	.....	6,750	12,772	—18,313
	Feb.	.....	95,123	29,821	130,726	31,724	26,737	5,918	67,698	7,643	139,720	—8,994	.....	6,750	—15,744	—9,691
	March	.....	116,347	33,775	157,581	32,832	27,484	6,508	72,828	8,379	148,031	9,550	.....	7,236	2,314	7,194
	April	740	122,643	32,410	161,071	35,988	23,810	6,709	84,145	8,159	158,811	2,260	.....	6,750	—4,490	—16,739
	May	.....	109,042	32,522	149,582	34,459	27,780	6,861	80,043	7,117	156,260	—6,678	.....	6,750	—13,428	—12,075
	June	.....	98,119	35,524	141,518	41,474	22,569	6,764	84,472	8,021	163,300	—21,782	.....	6,762	—28,544	—23,543
	Year	.....	1,259,605	410,189	1,747,940	385,452	285,096	65,459	813,439	84,376	1,633,822	114,118	.....	78,842	35,276	21,497
Missouri Pacific	May	3,883	1,473,393	372,279	2,050,471	324,446	307,082	54,436	867,347	71 850	1,625,161	425,310	—2,269	89,700	333,341	.....
	June	.....	1,415,157	435,383	2,055,346	273,332	313,445	60,963	829,460	62,865	1,540,065	515,281	—2,874	102,444	409,963	.....
	11 mos.	.....	16,909,693	4,219,138	23,357,033	3,617,418	3,509,811	625,784	9,519,738	683,802	17,956,552	5,400,481	—37,553	907,504	4,455,424	.....
Nevada Northern	June	165	125,682	11,965	141,329	10,509	15,352	343	22,211	3,889	52,304	89,025	.....	3,225	85,800	14,283
	Year	.....	1,292,375	170,486	1,511,309	87,224	145,953	4,222	300,223	43,644	581,266	930,043	.....	36,970	893,073	244,401
New Or. Great Northern	June△	275	106,444	31,258	144,858	19,421	11,825	2,671	58,707	4,398	97,021	47,837	—159	1,250	46,428	117,004
	Year	.....	1,064,474	354,709	1,497,649	241,638	189,036	28,535	393,492	57,898	910,599	587,050	—987	13,200	572,863	548,936
New Or., Mobile & Chicago	June	403	103,285	25,017	138,928	23,860	6,872	2,559	40,578	5,612	79,481	59,447	.....	3,804	55,643	32,391
	Year	.....	1,262,486	332,497	1,711,709	260,938	156,369	27,689	520,383	101,553	1,066,932	644,777	.....	43,587	601,190	139,668
Oregon & Washington	June¶	191	71,019	80,705	158,597	10,497	3,334	9,228	61,019	—3,491	80,586	78,011	—2,144	3,755	72,112	71,045
	Year	.....	332,447	333,563	705,497	67,881	15,966	51,344	329,065	23,610	487,866	217,631	—7,745	20,840	189,046	185,843
Philadelphia & Reading	June	1,024	2,837,826	577,699	3,575,925	464,330	550,205	39,971	1,151,434	67,652	2,273,592	1,302,333	51,070	201,816	1,151,587	172,588
	Year	.....	35,260,928	7,059,476	44,214,914	3,598,506	8,377,025	457,193	13,371,326	759,567	26,563,617	17,651,297	329,960	1,014,975	16,966,282	2,129,953
Port Reading	June	21	77,760	.....	78,961	12,783	26	30	21,592	80	34,511	44,450	3,061	.....	47,511	3,516
	Year	.....	1,153,877	.....	1,166,253	103,146	5,568	360	303,727	2,485	415,286	750,967	47,487	33,000	765,454	—38,932
St. Louis, I. Mt. & Southern	May	3,287	1,623,883	458,121	2,259,766	317,229	304,515	51,959	741,497	75,268	1,490,468	769,298	—3,023	72,345	693,930	408,607
	June○	.....	1,520,105	474,953	2,168,663	348,015	314,024	59,766	612,750	71,636	1,406,191	762,472	2,807	86,668	678,611	261,629
	Year	.....	19,367,143	5,431,579	26,916,891	3,991,720	3,724,133	675,141	8,386,175	841,194	17,618,363	9,298,528	—52,225	894,998	8,351,305	1,732,845
Spokane & Inland Empire	June	168	41,180	62,203	108,785	21,455	7,494	1,975	30,576	7,372	68,872	39,913	14,282	4,000	50,195	—6,826
	Year	.....	472,918	710,633	1,246,236	228,261	71,904	23,607	336,329	79,727	739,829	506,407	156,739	36,700	626,446	239,498
Spokane, Portland & Seattle	May	420	266,346	71,164	347,284	60,538	26,574	2,980	108,719	7,405	206,216	141,068	—725	20,700	119,642	60,860
	June	428	193,460	90,045	366,240	90,009	62,867	6,087	160,287	5,549	324,799	41,441	—1,703	21,800	17,938	—47,357
	Year	.....	2,525,337	820,799	3,566,291	653,868	359,554	41,978	1,252,310	79,252	2,386,962	1,179,329	—3,970	294,675	880,684	625,484
Wabash-Pittsburgh Terminal	June	63	50,610	6,736	60,226	8,162	34,756	2,090	24,484	6,332	75,824	—15,598	.....	40,779	—56,377	—50,770
	Year	.....	628,448	84,261	743,568	85,738	115,764	26,288	259,329	67,298	554,417	189,151	.....	105,579	83,572	—56,204
Wichita Valley	June♁	257	27,983	22,930	54,579	6,057	7,473	889	24,071	2,353	40,843	13,736	.....	237	13,499	6,457
	Year	.....	477,515	264,669	781,621	109,902	58,444	5,552	286,562	26,907	487,367	294,254	.....	20,839	273,415	20,084
Wisconsin Central	May✪	1,076	613,314	129,804	791,791	92,383	99,486	23,795	298,358	14,646	528,668	263,123	91	31,928	231,286	95,879
	June	.....	578,778	157,782	789,521	98,980	106,659	26,994	293,785	16,882	543,300	246,221	—252	32,067	213,902	49,556
	Year	.....	6,813,992	1,531,410	8,861,881	1,073,037	1,171,035	268,441	3,129,047	195,032	5,836,592	3,025,239	7,038	366,548	2,665,729	611,396

* Began operations on Sept. 1, 1909. ‖ Began operations on Aug. 9, 1909. Mileage operated on June 30,1909: † 254 miles; ‡ 167 miles; § In July, August, September, October, November and December, 1909, 617 miles; January, February, March, April, May and June, 1910, 660 miles. △ 92 miles; ¶ 6 miles; ○ 2,608 miles; ♁ 174 miles; ✪ 1,030 miles.

President Ripley on Railway Capitalization and Rates.

President Ripley of the Santa Fe on October 27 made public at Topeka a letter he had written to Governor Stubbs of Kansas regarding the subject of railway capitalization and rates. The letter was in reply to one which had been written by Governor Stubbs to him. In the course of his letter Mr. Ripley said:

"Our rates as they stand to-day are a growth—the result of experience; of contact with shippers; of conference and compromise—in many cases of concession to public opinion even when we believed that public opinion to be mistaken. Also they are the results of competition between railways, between railways and waterways, between markets and between individuals, and lastly, they are in part due to legislation and national laws, mostly unintelligent and passed in time of popular hysteria. If all these influences combined have not produced a perfect result are not the public and the law-makers at least in part responsible?

"In my forty years' experience in the consideration of railway rates I have not known of a case in which the physical value of the railway property or its capitalization was given any consideration. The needs of the community, the value of the property to be transported, the price at the originating point and at destination, the shipper's view of what he can afford to pay, the rates prevailing in adjacent territory, whether by rail or water, and in general the value of the service, are the factors which determine the rates, when not interfered with by the various 'regulating' bodies, which occasionally cast stones into the meshes of the machinery. For instance, the four trunk lines in Kansas must perforce have the same rates, yet their capitalization ranges from about $45,000 for the Missouri Pacific to about $100,000 for the Union Pacific. The rates of these four must not only be identical at the various junctions with each other, but also at local points, because the rates at a station on the Santa Fe must not be higher or lower than at a station 20 miles across country on the Missouri Pacific.

"You cite the supreme court decision in the gas company case, where a 6 per cent. return was held sufficient, but in that case the court said that in determining the sufficiency of a particular rate of compensation 'the amount of risk in the business is a most important factor,' and this factor the court found was 'reduced almost to a minimum.' In the case of railways, however, this element of risk, you must admit, is large and constant. You also ask why the railways appeal to the courts alleging that various legislative bodies are attempting to confiscate their property. I am not a lawyer, but I imagine the idea is that only by alleging a violation of the Federal Constitution can the protection of the United States courts be invoked. The acts of state legislatures and the orders of state commissions fixing rates have been sucessfully attacked because the facts in given cases showed that such rates were plainly confiscatory, and, hence, it was unnecessary to ask for a finding as to the limits of a reasonable return upon a business involving so much risk as that of railroading. In the gas case, the court recognized that there was a 'line of division between possible confiscation and proper regulation,' and that line has to be judicially determined. I believe the courts will hold that the limit of proper regulation has been passed if any carrier be deprived of the reasonable compensation it has a right to expect, considering the value of the services rendered, regardless of the exact percentage of profit from its operations."

Mr. Ripley added that when he said that the capitalization of the Santa Fe represents money actually invested in it, he had reference to the present company, which began business 15 years ago, taking over the property of the bankrupt company. He said that in the 26 years' experience of the old company, the average return on its capitalization was 3.23 per cent. on its bonds and 2.12 per cent. on its stock. He added, "Now, you may assume, if you please, that a considerable part of the original capitalization represented only the hopes of the promoters, but even supposing that one-half of it was what you call 'water' (which would be a violent assumption), it appears that the owners of this great property, which has been the chief factor in making Kansas what it is to-day, have received a totally inadequate return for the use of their money, to say nothing of the risk they took."

On October 27 Mr. Ripley delivered an address at a mass meeting given in his honor by the citizens of Topeka, in which he said that all the railway asks of the public is protection for its property, and freedom from interference with its business methods as long as they are clean and honest. He said that in the 41 years since the original line was projected it had paid its owners less than 3 per cent. on its capitalization, and that the Santa Fe had been forced into a publicity campaign because of the action of public officers in insistently criticizing and misrepresenting it.

National Industrial Traffic League.

The annual meeting of the National Industrial Traffic League was held in Chicago last week. The committee on tracing of freight made a report urging shippers to desist from tracing unless there is some definite and urgent reason. "No tracer should be started," said the committee, "until a complaint has been received from the consignee of the non-arrival of the whole shipment or a part thereof, and then only after a reasonable time has elapsed for the consignment to reach destination, unless the shipper has information that his goods are being delayed at some point in transit." The committee finds that shippers are making so many tracing requests for which there is no good reason that they are interfering with the effectiveness of legitimate tracing. A statement of a car-service officer of a western trunk line was quoted, in which he said that between 6:30 and 9:30 p.m. of a single day he received telegraphic tracers for 125 cars. The next morning he found that there had been received 223 more, making a total of 348 wire tracers received between 6:30 p.m. and 8 a.m., and, besides, as many more came in by the morning mail. The committee said that the carriers have their operating departments so organized as to expeditiously move the business under ordinary conditions, and that ordinarily the tracing of freight will not hasten a shipment. W. E. Beecham, car accountant of the Chicago, Milwaukee & St. Paul, who was present to address the meeting on behalf of the General Superintendents' Association, said that at certain seasons congestions occur and cannot be avoided. The carriers are willing to establish and keep in commission a tracing department equal to the demands of any ordinary conditions, but they should not be held responsible for the faults of shippers. The tracing department cannot move traffic when the motive power is unable to do so, and, of course, every road in the country makes it a practice to move its freight in the most expeditious manner practicable.

The committee on loss and damage from team tracks said that it is the judgment of the league's legislative committee "that where delivery is made to the consignee on public team tracks, it is the duty of the railway, both as a carrier and a warehouse man, to exercise the same care in the protection of property being handled from the team track that it does for property being unloaded through their depots, and must afford reasonable police protection until delivery is actually made to the consignee. If, however, consignee fails to remove the property within a reasonable time, the liability of the carrier as a warehouse man will be lessened accordingly." As to package freight delivered from team tracks, it was the judgment of the legislative committee that the liability of the carrier ceases when delivery has been effected at the car door. Two subjects, "Control of Coastwise Traffic by the Interstate Commerce Commission" and "Ownership and Control of Competing Water Carriers," were laid on the table, as differences developed between the members as to what policy the government should pursue as to these matters.

The committee on re-issuing tariffs to show changes from former issues called attention to the order issued by the Interstate Commerce Commission on July 13, 1910, requiring that all tariff publications filed with the commission after September 1 must indicate, by the use of black-face type or by the use of symbols with proper explanations, all increases in rates, and the committee on simplification of tariffs was authorized to see if tariffs could not be so printed as to show decreases as well as increases in rates.

The following officers for the ensuing year were elected:

President, J. C. Lincoln, St. Louis.

Vice-president, W. M. Hopkins, Chicago.

Secretary-treasurer, O. F. Bell, Chicago.

Honorary vice-presidents: J. S. Marvin, New York; H. W. B. Glover, Atlanta; J. S. Davant, Memphis; J. H. Johnston, Oklahoma City; C. R. Rust, Duluth; F. B. Gregson, Los Angeles; D. O. Ives, Boston; Jno. Wunderlick, Cedar Rapids; H. M. Newlin, Philadelphia; R. E. Hanley, Buffalo.

Directors: S. H. Babcock, Salt Lake City; H. C. Barlow, Chicago; I. S. Bassett, Pittsburgh; Geo. T. Bell, Sioux City; J. M. Belleville, Pittsburgh; F. T. Bentley, Chicago; C. J. Bertchy, Milwaukee; L. B. Boswell, Quincy; Jas. Collord, Buffalo; M. S. Dean, Chicago; A. R. Ebi, Moline; W. J. Evans, Chicago; W. H. Frederick, Buffalo; C. B. Gregory, Rockford; J. M. Guild, Omaha; W. D. Hurlbut, Chicago; C. A. Jennings, Chicago; Jos. Keavy, Indianapolis; F. W. Maxwell, Denver; E. J. McVann, Omaha; F. B. Montgomery, Chicago; R. Muehlberg, St. Louis; B. H. O'Meara, Cedar Rapids; E. A. Risdon, Duluth; G. A. Schroeder, Milwaukee; J. J. Telford, Louisville; W. P. Trickett, Minneapolis; W. R. Wheeler, San Francisco; E. E. Williamson, Cincinnati; H. G. Wilson, Kansas City; E. G. Wylie, Des Moines.

INTERSTATE COMMERCE COMMISSION.

John T. Marchand, for several years personal representative of President Winchell, of the Rock Island, has been appointed an attorney for the Interstate Commerce Commission.

Jurisdiction Over Private Cars.

Pat. Chappelle v. Louisville & Nashville. Opinion by Commissioner Lane:

Petition of defendant for rehearing denied, the commission reaffirming its right to exercise jurisdiction over private cars when used for the conveyance of amusement outfits, theatrcal companies, and the like. (19 I. C. C., 456.)

Effect of Competition at Minneapolis Recognized.

Omaha Grain Exchange v. Chicago & North Western et al. Opinion by Commissioner Clark:

Complaint alleges unreasonable rates on grain from parts of South Dakota, Minnesota and Iowa to Omaha, Nebr., as compared with the rates from same points to other markets; the real and important question here is whether or not defendants shall be required to establish rates from the territory in question to Omaha on a basis of like rates for like distances as compared with their rates from same points to Minneapolis. It is held that the rates to Minneapolis are strongly influenced or controlled by competitive conditions which do not likewise affect the rates to Omaha. The interests of the Minneapolis lines which do not also reach Omaha, as well as the demands of the milling interests at Minneapolis, create conditions which, as to the rates and transportation to Minneapolis, are substantially dissimilar from those which apply to the rates and the transportation to Omaha. (19 I. C. C., 424.)

Validation of Excursion Tickets.

In re extra fare paid by reason of non-validation of limited excursion tickets. Opinion by Chairman Knapp.

The commission on its own motion investigated the subject of validation regulations, and has decided that a regulation by a railway company which provides that a person who fails to have the return portion of his excursion ticket validated must pay the one-way fare to the conductor, and that the railway will refund this fare on the passenger's proving that he returned over the same road that his ticket called for and that with the exception of having the ticket validated he fulfilled all the contracts of the ticket. (19 I. C. C., 440.)

George W. Riter v. Oregon Short Line et al. Opinion by Commissioner Prouty:

There is great force in the position of complainant that good faith to the public would require defendants to state in advertisements of their excursions the total amount which would be exacted for the transportation service, of which validation is a part; but it is difficult to see how it can be held to be a violation of the act to regulate commerce to exact a part of the tariff rate at the ticket office when the ticket is sold and the balance of that rate at the validating agency when the ticket is validated.

While it seems probable that in some instances the place of validation might be made more convenient than it now is and that the annoyance to the public might be somewhat lessened, still upon the showing made in this record and upon knowledge of the situation, the commission hesitates to interfere by any general rule. If special instances arise where the inconvenience is undue, those can be dealt with individually.

It has been assumed that the validation of these excursion tickets was a regulation or practice which fell within the jurisdiction of this commission, but that point has not been particularly considered, and is not decided.

Under the method of handling these validation fees they never find their way into the revenue returns of the carriers to this commission. In some way those fees should find their way into the accounts of the railways; but the circumstance that a proper account of the fees is not given does not of necessity stamp the exaction of it or the method of its exaction as illegal.

Complainant's contention that the manner in which these validation fees are handled amounts to a violation of the fifth section of the act is not sustained. (19 I. C. C., 443.)

COURT NEWS.

A press despatch from Ogden says that a clothing dealer of that city has been convicted and fined $300 for riding on a pass from Ogden to Reno last July, at the time of the prize fight, and a representative of the Southern Pacific has been arrested for giving the pass.

A recent decision of the supreme court of Montana held that railway employees cannot use in that state any passes excepting those issued by the lines by which they are employed. The consequence is that all traveling representatives of the roads are having to pay cash fares when off the lines of their own roads.

The Supreme Court of the United States has denied the application of the state of Oklahoma for writs of certiorari to take from the federal court of appeals the appeals of the state from the order restraining the Oklahoma railway commission from enforcing its orders reducing commodity and passenger rates within that state. The ground for the motion was that as the state court had declared the orders legal, there was an unseemly conflict between the federal and state courts.

The United States circuit court, at St. Paul, October 27, issued an order restraining the Interstate Commerce Commission from enforcing its decision requiring the railways to reduce their rates on lemons from California to eastern points from $1.15 to $1. The court said that the question presented was very important, that the judges had serious doubts as to the validity of the order, and that they felt it should be suspended until it could be passed on by the new commerce court.

The United States circuit court of appeals at Chicago on October 25 entered a decree putting in effect the orders of the Interstate Commerce Commission in the Missouri river and the Denver rate cases. These are the cases in which the Interstate Commerce Commission held that the through rate should ordinarily be less than the sum of the local rates, and required that through rates less than the sums of the locals be made to cities on the Missouri river and to Denver. The shippers interested in this litigation will present to the Interstate Commerce Commission petitions for reparation amounting to $500,000, the reparation being demanded because the railways kept in effect the higher rates after the Interstate Commission had ordered them reduced.

Judge Tuthill, of the circuit court of Cook county, Illinois, on October 28 dissolved a temporary injunction which he had previously issued restraining the Parmelee Transfer Company and seven railways entering Chicago from carrying out an agreement to give the Parmelee company the exclusive privilege of checking railway baggage from residences in Chicago to destinations. The injunction had been issued on the prayer of the Frank E. Scott Transfer Company. In dissolving it Judge Tuthill said that the railway companies have the full right to select a transfer company to handle baggage checks. The Parmelee company alleged that the Scott company had offered to sell out to it at an exorbitant price and that the litigation was begun to compel acceptance of the offer.

Mileage Tickets in South Carolina.

The supreme court of South Carolina has rendered a decision to the effect that a specific contract is made when a mileage ticket is bought, and that the purchaser must exercise reasonable diligence to get the coupons exchanged for a ticket according to the rule in the contract, wherever practicable. If there is a ticket agent at a station, the mileage book holder must get his ticket. If there is none then the mileage book coupons may be tendered for passage on the train. The case was brought by Des Portes against the Southern Railway, and a lower court had given him damages for ejectment; but the supreme court reversed the judgment.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

The officers of the Stockton Terminal & Eastern, a new line in California, are as follows: M. J. Gardner, president; F. J. W. Dietrich, first vice-president; Andrew McCormick, second vice-president; J. E. Adams, secretary, and A. D. Rothenbush, treasurer, all with offices at Stockton, Cal.

Incident to the separation of the management of the Chicago & Alton and the Toledo, St. Louis & Western from that of the Minneapolis & St. Louis and the Iowa Central, George H. Ross, vice-president of the four roads, resigns from the Minneapolis & St. Louis and the Iowa Central, and will continue as vice-president of the other two. C. H. Ackert, vice-president in charge of operation of the four roads, resigns, and W. G. Bierd, general manager of the Minneapolis & St. Louis and the Iowa Central, has been appointed vice-president and general manager of those two roads, with office at Minneapolis, Minn. (See item under Operating Officers.) E. S. Benson resigns as comptroller of the four roads, and has been appointed auditor of the Chicago & Alton and the Toledo, St. Louis & Western, with office at Chicago, succeeding W. D. Tucker, resigned.

Operating Officers.

W. M. Jaekle has been appointed assistant superintendent of the Oregon Railroad & Navigation Co., with office at Portland, Ore., succeeding C. P. A. Lonergan, resigned.

A. F. Helm, trainmaster of the Wabash Railroad, at Decatur, Ill., has been appointed superintendent of the Detroit and Buffalo divisions, with office at Detroit, Mich., succeeding to the duties of W. C. Heth, acting superintendent, who has been assigned to other duties.

D. C. Cheney, assistant general superintendent of the Chicago, Milwaukee & St. Paul at Milwaukee, Wis., has been appointed a fuel inspector, with office at Chicago. P. C. Eldredge, division superintendent at Milwaukee, succeeds Mr. Cheney, and F. M. Miller succeeds Mr. Eldredge.

Incident to the separation of the management of the Chicago & Alton and the Toledo, St. Louis & Western from that of the Minneapolis & St. Louis and the Iowa Central, F. W. Morse has been appointed general manager of the Chicago & Alton and the Toledo, St. Louis & Western, with office at Chicago. See item under Executive, Financial and Legal Officers.

H. C. Manchester, assistant superintendent of motive power of the Maine Central, the Washington County and the Somerset Railway at Portland, Me., has been appointed superintendent of transportation of these roads and the Sebasticook & Moosehead, with office at Portland. He will have jurisdiction over train and station service matters, the distribution of power and passenger equipment and the supervision of train and steamer schedules.

The Hine system of organization having been established on the Wyoming division of the Union Pacific, the titles of master mechanic, division engineer, trainmaster, traveling engineer and assistant engineer have been abolished, and the following officers, as well as H. J. Roth, now assistant superintendent at Cheyenne, Wyo., will hereafter be designated as assistant superintendent: Wm. Niland, master mechanic; G. R. Smith, trainmaster; Otis Thayer, assistant engineer, and A. J. Wharf, division engineer, all with offices at Cheyenne, and F. C. Letts, trainmaster at Laramie, Wyo., and M. F. White, trainmaster at North Platte, Neb.

R. E. Boswell, superintendent of the Sixth division of the Seaboard Air Line, at Jacksonville, Fla., having resigned to engage in other business, that division has been abolished and the territory south of Columbia, S. C., has been re-divisioned. There will be two divisions in future instead of three. H. B. Grimshaw, superintendent of the Fifth division, at Savannah, Ga., has been appointed superintendent of the new Fourth division, with office at Savannah, in charge of the territory from Columbia to Jacksonville, and from Savannah to Montgomery, Ala., including branches. W. A. Witt, superintendent of the First division, at Richmond, Va., has been appointed superintendent of the new Fifth division, with office at Jacksonville, in charge of the territory from Fernandina, Fla., to Chattahoochee river, and from Jacksonville to Tampa, including branches.

A. H. Westfall, general superintendent of the Chicago & Alton and the Toledo, St. Louis & Western at Bloomington, Ill., has been appointed general manager of the Chicago, Indianapolis & Louisville, with office at Chicago, succeeding B. E. Taylor, resigned. A photograph of Mr. Westfall and a sketch of his career were published in the *Railway Age Gazette* of April 8, 1910, page 967.

P. G. Walton, superintendent of the Chicago & Alton at Bloomington, Ill., has been appointed superintendent of the Chicago, Indianapolis & Louisville, with office at Lafayette, Ind., succeeding J. V. Sucese, resigned.

Traffic Officers.

C. Morrison has been appointed an agent of the Erie Despatch, with office at Toledo, Ohio, succeeding G. E. Hurlbut, resigned.

Kean B. Wells has been appointed a soliciting agent of the Louisville & Nashville, with office at Louisville, Ky., succeeding Russell Houston, resigned.

J. M. Green has been appointed a commercial agent of the Missouri, Kansas & Texas, with office at Pittsburgh, Pa., succeeding Paul Gruber, retired.

F. H. Dowle has been appointed general agent of the Erie Railroad for lines at Buffalo, N. Y., and Salamanca, and the West, with office at Detroit, Mich.

Charles E. McPherson, general passenger agent of the Canadian Pacific, lines west, at Winnipeg, Man., has been appointed assistant passenger traffic manager of the western lines, with office at Winnipeg, succeeding C. E. E. Ussher, promoted.

Oscar Townsend, assistant general freight agent of the Chicago Great Western at Pittsburgh, Pa., has been appointed an assistant general freight agent, with office at St. Paul, Minn., succeeding George F. Thomas, resigned to engage in other business.

R. R. Mitchel', assistant general freight agent of the Kansas City Southern at Texarkana, Tex., has been appointed general freight agent, with office at Kansas City, Mo., succeeding E. E. Smythe. G. B. Wood, general agent at Mena, Ark., succeeds Mr. Mitchell.

H. F. Latimer, traveling passenger agent of the Queen & Crescent Route at Birmingham, Ala., has been appointed a division passenger agent, with office at Birmingham. G. A. Lawton, city passenger and ticket agent at Chattanooga, Tenn., has been appointed a traveling passenger agent, with office at Chattanooga.

E. W. Clapp, chief clerk in the freight department of the Southern Pacific and the Galveston, Harrisburg & San Antonio at San Francisco, Cal., has been appointed general agent in the freight department, with office at San Francisco. W. A. Golden, traveling passenger agent of the Union Pacific and Southern Pacific at Pittsburgh, Pa., has been transferred to Los Angeles, Cal., and C. W. Jennings has been appointed a traveling passenger agent, with office at San Francisco.

George C. Wells assistant general passenger agent, eastern lines, of the Canadian Pacific, at Montreal, Que., has been appointed assistant to passenger traffic manager, with office at Montreal. He will have charge of the passenger rate bureau in addition to his other duties. C. B. Foster, assistant general passenger agent at Vancouver, B. C., has been appointed general passenger agent, western lines, Revelstoke, B. C., and east, with office at Winnipeg, Man., and H. W. Brodie, assistant general passenger agent at Winnipeg, Man., has been appointed general passenger agent, western lines, west of Revelstoke, with office at Vancouver, B. C. A. C. Shaw, general agent, passenger department, at Chicago, succeeds Mr. Brodie, with office at Winnipeg, Man. A. B. Calder, general agent at Seattle, Wash., succeeds Mr. Shaw, with office at Chicago, and E. E. Penn, general agent at San Francisco, Cal., succeeds Mr. Calder, with office at Seattle.

Engineering and Rolling Stock Officers.

C. T. Ripley and B. Hoffman have been appointed assistant engineers of tests of the Atchison, Topeka & Santa Fe, both with offices at Topeka, Kan.

J. L. Butler, master mechanic on the White river division of the St. Louis, Iron Mountain & Southern at Cotter, Ark., has been transferred to Crane, Mo.

Edwin Schenck, Jr., assistant master mechanic of the Pennsylvania Railroad, at Meadows, N. J., has been appointed assistant master mechanic at the Trenton shops, succeeding F. E. Marsh, promoted.

D. E. Sullivan, master mechanic of the Union Pacific at Evanston, Wyo., and P. A. Beck, supervisor of bridges and buildings at Ogden, Utah, have had their offices removed to Green River, Wyo.

Wm. Garstang, superintendent of motive power of the Cleveland, Cincinnati, Chicago & St. Louis at Indianapolis, Ind., has been appointed also superintendent of motive power of the Cincinnati Northern, with office at Indianapolis.

B. M. Angwin has been appointed master car builder of the Birmingham Southern, with office at Pratt City, Ala., succeeding J. N. Collins, deceased, and S. T. Harris has been appointed foreman of car shops at Pratt City, succeeding N. W. Howell, resigned.

W. H. Dooley, master mechanic of the Alabama Great Southern at Birmingham, Ala., has been appointed superintendent of motive power of that company and the Cincinnati, New Orleans & Texas Pacific, with office at Ludlow, Ky., succeeding J. P. McCuen, retired on account of ill health. Joseph Quigley, general foreman of the Chattanooga, Tenn., shops of the Cincinnati, New Orleans & Texas Pacific, succeeds Mr. Dooley, and H. B. Hayes, general foreman of the Danville, Ky., shops, succeeds Mr. Quigley. C. L. Shattuck succeeds Mr. Hayes.

Purchasing Officers.

Incident to the resignation of W. J. Souder as auditor and purchasing agent of the St. Paul & Des Moines, R. G. Smock, secretary, with office at Des Moines, Iowa, will hereafter have charge of the purchase of all materials and supplies.

OBITUARY.

W. T. Condon, traveling agent of the Chicago & North Western, with office at Helena, Mont., died at Helena on October 24.

M. Hayes, formerly secretary and treasurer of the Delaware Railroad, now a part of the Philadelphia, Baltimore & Washington, died at his home in Dover, Del., October 31, at the age of 93 years. Mr. Hayes was for many years a trustee of Delaware College, at Newark.

J. M. Frazer, general treasurer of the National Railways of Mexico, at Mexico City, Mex., died on October 28 in New York at the age of 81. Mr. Frazer was treasurer of the National Railroad of Mexico at the time it was taken over in 1908 to form part of the National Railways of Mexico, and previous to his service with the Mexican lines he was for many years treasurer of the Mobile & Girard, now a part of the Central of Georgia.

Edwin P. Dawley, for many years connected with the New York, New Haven & Hartford as civil engineer, died at his home in Providence, R. I., October 7, after a short illness, at the age of 57. Mr. Dawley was born in Providence and was a graduate of Brown University. He had been a civil engineer throughout his active career. He was chief engineer of the New York, Providence & Boston when that road was absorbed by the New York, New Haven & Hartford, and after the consolidation was continued as division engineer. It was during his administration that the company built the first bridge across the Thames river at New London and bought the Cove at Providence and built the new station on the site thus prepared. He was the first to suggest the tunnel through the east side hill at Providence, and he was the engineer of construction when it was made. This was in 1904-1907, ten years after the project was first broached. Mr. Dawley retired from the regular service of the road in March, 1909, and opened an office in Providence.

Railway Construction.

New Incorporations, Surveys, Etc.

Alberta Electric.—According to press reports from Medicine Hat, Alb., this company has applied to the Dominion government for a charter. The plans call for an electric line to connect Medicine Hat, Calgary, Lethbridge, Banff and McLeod.

Alta & Jordan Valley.—Incorporated in Utah, with $200,000 capital, to build from Sandy, Utah, east to Alta, 16 miles. B. F. Cummings, president; W. F. Williams, secretary and treasurer, and M. A. Williams, vice-president, all of Salt Lake City.

Arbuckle & Western.—An officer writes that it is expected that grading work will be begun within 30 days on this line. The company was organized to build from Ardmore, Okla., northwest to Chickasha, 110 miles, with a branch from Milo, west to Lawton, 80 miles. There will be a number of short steel or concrete bridges, and probably one important trestle. Contracts have not yet been let. Oscar O. Ayres, president and acting chief engineer, Ardmore. (April 8, p. 969.)

Canadian Northern.—According to press reports, construction work on about 150 miles from Victoria to Barclay sound, on Vancouver Island, B. C., will be commenced soon. The route from Victoria is north and west via Esquimault, Pedder bay and Mathiesen lake to Sooke harbor, thence up Sooke river and lake to Shawnigan lake, and crossing the Keksilah to Cowichan river, thence to Cowichan lake, and following the Nitiant valley and Coleman Creek valley to upper Barkley sound and along Alberni canal to Alberni, and it is proposed to eventually extend the line northerly via Comox lake and Bute lake to either Hardy bay or Quatsino sound. (July 22, p. 173.)

The Railway Commissioners of Canada have approved the location of the line through townships 26-23, range 24, west fourth meridian, west fifth meridian, Alberta, mile 212.83 to 257.32, reckoned from the junction with the main line at Vegreville, Alb., and has also authorized the company to build a branch through townships 24 and 25, range 15, west of principal meridian, Manitoba, 6 miles, reckoned from the junction with the Ochre River branch.

Canadian Northern Ontario.—The Railway Commissioners of Canada have approved the revised location of the line from Deseronto, Ont., to Shannonville, through the townships of Tyendinga and Thurlow, 12.61 miles.

Canadian Pacific.—The Railway Commissioners of Canada have authorized this company to open for traffic a 14-mile section of the line known as the Virden-MacAuley branch; also a section of the line known as the Pheasant Hills branch, from mile 430.39 to mile 561.63, between Wilkie, Sask., and Hardisty, Man.

Carnesville Railway.—An incorporator writes that a charter has just been secured in Georgia and the prospects of building are good. The projected route is from Toccoa, Ga., south via Mize and Red Hill to Carnesville, about 20 miles. Maximum grades will be 2 per cent. and maximum curvature eight degrees. W. S. Erwin, Clarkesville, is an incorporator.

Chicago, Weatherford & Brazos Valley.—This company is said to have filed an amendment to its charter, providing for the construction of a 60-mile extension from Bridgeport, Wise county, Tex., northeast to Gainesville. Col. R. E. Bell and J. W. Hicks, Weatherford, are interested.

Cincinnati, New Orleans & Texas Pacific.—Second-track work has been authorized on 12.4 miles between Oakdale, Tenn., and Lancing. This will complete the double-track from Harriman Junction north to Lancing, with the exception of a section of 1.6 miles, on which there are three tunnels and a bridge. On the completion of this work the company will have 74 miles of double-track between Cincinnati, Ohio and Chattanooga, Tenn.

Cleveland, Barberton, Coshocton & Zanesville (Electric).—An officer writes that the general contract to build the first section of 50 miles from Cleveland, Ohio, south, has been let to A. De Mayo & Co., Montreal, Que. The plans call for a line from Cleveland south via Copley, Barberton and Doylestown to Orrville. Maximum grades will be 2.5 per cent. and maximum curvature 8 degs. J. J. Breitinger, president, 1005 Scho-

field building; L. C. Marble, chief engineer, 312 Lenox building, both of Cleveland.

DELAWARE, LACKAWANNA & WESTERN.—An officer writes regarding the improvements to be carried out on the Montclair branch that a contract has been given to Reiter, Curtis & Hill, Philadelphia, Pa., for work through Bloomfield, N. J., and at Watsessing, including the stations. Residents of Montclair have submitted to the company suggestions for changes in the plans for the terminal improvements to be made at that place. The changes call for the lowering of the track terminals to lessen the grades of the viaduct on Grove street; the covering of the driveway at the approach to the terminal; provision for a Y for the street railway company at the terminal plaza; construction of a foot bridge over Pine street, and the depression of Bay street, to eliminate the grade crossing at that point.

DENVER & RIO GRANDE.—According to press reports, this company has under consideration the question of building an extension southwest to St. George, Washington county, Utah. Surveys have already been made.

DES CHUTES RAILROAD.—See Union Pacific.

ENID, OCHILTREE & WESTERN.—According to press reports, this company is now operating trains from Dalhart, Tex., east to Victory, 10 miles.

HARRIMAN, KNOXVILLE & EASTERN.—An officer writes that a contract has been given to the McDowell Contracting Co., Knoxville, Tenn., for work on a section of this line. The plans call for a line from Harriman, Tenn., east via Knoxville, through Roane, Anderson, Knox and Sevier counties, thence to a point in North Carolina. Maximum grades eastbound will be 0.65 per cent. compensated and maximum grades westbound will be 1 per cent. compensated; maximum curvature 6 degs. The work will be medium mountain work. There will be one steel bridge and five or six trestles. S. E. Hendrick, president, and W. J. Clarke, chief engineer, Harriman.

HUDSON RIVER & EASTERN TRACTION.—Application has been made to the New York Public Service Commission, Second district, for permission to issue bonds for an amount sufficient to extend this road. The route is from the present terminus in Ossining, N. Y., southeast through Briarcliff Manor, Pleasantville and Sherman Park to White Plains, about 18 miles.

LAKE CREEK & COEUR D'ALENE.—See Union Pacific.

LOS ANGELES PACIFIC (ELECTRIC).—Improvements are being made to this road in and near Los Angeles, Cal., at a cost of $500,000. New rail is being laid on the Hollywood line, and plans are under consideration for a line from Hermosa Beach to Inglewood.

MALHEUR VALLEY RAILWAY.—See Union Pacific.

MINIDOKA & SOUTHWESTERN.—See Union Pacific.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—The report of this company for the year ended June 30, 1910, shows that the improvements to the terminal properties at St. Paul, Minn., including freight houses, storage tracks, etc., are about finished. Track laying on the Bemidji & Cas Lake division, on which construction was started in 1909, from Moose Lake, Minn., northwest to Plummer, has been finished, and the line will shortly be put in operation. During the year the company bought the Cuyuna Iron Range Railway and completed the line, which is now 37 miles long, connecting with the main line at Lawlor, Minn. An ore dock, to have a capacity of 35,000 tons, is now being built at Superior, Wis. Improvements were also carried out during the year on the old Duluth line and on the terminal properties at Superior and Duluth.

MISSOURI, OKLAHOMA & GULF.—Arrangements are said to be under way for building a branch from the main line west to Okmulgee, Okla.

MOUNTAIN VALLEY & PLAINS.—According to press reports, this company has under consideration the question of building a line from Springer, N. Mex., west through Arizona to San Francisco, Cal. The company was organized last year to build from Cimarron, N. Mex., east through the panhandle of Texas to Guthrie, Okla., 450 miles, and grading work has been started. J. H. Conlin, chief engineer, Dalhart, Tex. (March 4, p. 461.)

NEW YORK SUBWAYS.—The recent advertisements of the New York State Public Service Commission, First district, asking for bids for the construction of underground railways in New York City with private capital, brought out no responses; but similar advertisements asking for bids for the construction of the railways with money furnished by the city, responses to which were opened October 27, brought offers from 23 contractors. The plans of the proposed work, as made by the commission, divide the territory into 21 sections, and a number of the bidders put in separate proposals for each section, so that at the present writing the tabulation and comparison of the bids has not been completed, because of the large amount of clerical work necessary to put the information in suitable form for comparison.

OMAHA & WESTERN IOWA TRACTION.—Incorporated in South Dakota, with $250,000 capital and office at Omaha, Neb., to build from Omaha, via Council Bluffs, Iowa, north to Sioux City, 90 miles. The estimated cost of the line is $20,000 a mile. The incorporators include: C. E. Brown, M. E. Gallian, C. D. McDonough, D. J. Avery, Chicago, and J. S. Sebree, Peoria, S. Dak.

OREGON RAILROAD & NAVIGATION CO.—See Union Pacific.

OREGON, WASHINGTON & IDAHO.—See Union Pacific.

PACIFIC & EASTERN.—According to press reports, work on the extension from Eagle Point, Ore., northeast to Butte Falls, about 40 miles, will be finished about the middle of November.

PACIFIC ELECTRIC.—This company will extend its line from La Habra, Cal., through Yorba Linda, 2.5 miles, and will build a line from Covina to Pomona. Plans are under consideration for a line from San Dimas to Claremont, or to a connection with the Claremont system at North Pomona. Work is now under way on an extension of the line through the city of Pomona. A line is also to be built through San Fernando valley from Los Angeles to Burbank.

ST. LOUIS & SAN FRANCISCO.—The report of this company for the year ended June 30, 1910, under date of October 1, shows that during the year a branch was built between Marion, Ark., and Hulbert, 5.49 miles, connecting the tracks of the 'Frisco with the Chicago, Rock Island & Pacific at Hulbert. This cut-off shortens the distance for through traffic between the two lines, besides materially facilitating the transfer of freight between the terminal yards of these companies, and relieving the terminal situation in Memphis proper, which is often congested. Extensive yards were built at Marion to provide for such interchange. Improvements were made, including the replacing of 972 ft. of metal bridges with metal bridges of heavier design; 2,620 ft. of trestles were filled; 600 ft. of trestles were replaced by concrete; 188 ft. of metal bridges were replaced by concrete, and 164 ft. of new metal bridges were constructed. New overhead steel bridges, 360 ft. long each, were constructed at Tulsa, Okla., and at Sapulpa; 18,157 tons of 85-lb. rail, 751 tons of 75-lb. rail, and 1,041 tons of 65-lb. rail were laid in main tracks during the year; 119.55 miles of track was ballasted and 54.82 miles of side-tracks were added. (See report of this company elsewhere in these columns.)

A press report from San Antonio, Tex., says that the 'Frisco has obtained control of the San Antonio & Aransas Pass from the Southern Pacific, and is planning to build an extension from Brady to Comfort to secure a short line from Chicago to San Antonio.

SALMON RIVER RAILWAY.—See Union Pacific.

TEXAS ROADS (ELECTRIC).—According to press reports, preliminary survey has been finished by the Stone & Webster Corporation, Boston, Mass., for the line between Houston, Tex., and Dallas. (Sept. 16, p. 521.)

TIDEWATER & SOUTHERN (ELECTRIC).—Incorporated at Stockton, Cal., with $1,000,000 capital, to build from Stockton, southeast via Modesto to Turlock, with a branch to Ripon, in all about 50 miles. The incorporators include J. A. Mehling, J. A. Coley, K. C. Brueck and B. A. Bearce.

UNION PACIFIC.—The report of this company for the year ended June 30, 1910, under date of October 3, shows that the following lines were opened for traffic during the year: Oshkosh, Neb., to Northport, 44.47 miles; Sand Creek Junction, Colo., to St. Vrains, 17.45 miles; Greeley, Colo., to Briggsdale, 26.16 miles; Cloverly, Colo., to Hungerford, 13.16 miles; on the Nebraska division, 47.76 miles of second track, and on the Wyo-

ming division 10.57 miles was added. During the year there was a net increase in sidings of 78.34 miles.

Lake Creek & Coeur d'Alene has been opened from Lake Junction, Wash., to Lake Point, Idaho, 14.18 miles.

Oregon, Washington & Idaho, from Lewiston Junction, Wash., to Lewiston, Idaho, 72.03 miles, has been operated since December 3, 1909, by the Camas Prairie Railroad Co. for the account of the Oregon Railroad & Navigation Co.

In addition to the lines completed, construction work is under way on 348.17 miles of new lines as follows: Dent, Colo., to Fort Collins, 24.75 miles, grading finished on 18.52 miles and grading work under way on 2.16 miles; Rock Springs, Wyo., to Kilpacker creek, 21.73 miles, grading finished on 10.40 miles.

Malheur Valley Railway, from Vail, Ore., to Brogan, 23.77 miles, track laid on 21.42 miles and grading finished on 2.35 miles.

Minidoka & Southwestern, from Rupert, Idaho, to Bliss, 72.78 miles, track laid on 5.93 miles, grading finished on 65.10 miles and grading under way on 1.75 miles; Burley, Idaho, to Oakley, 22.09 miles, grading work finished.

Salmon River, from Moreland, Idaho, to Aberdeen, 28.80 miles, track laid on 10.86 miles and grading finished on 17.48 miles.

Oregon Railroad & Navigation Co., from St. Johns, Ore., to Woodlawn, seven miles, track laid on 5.47 miles and grading finished on 1.53 miles; Woodlawn to Troutdale, 13 miles, grading finished on two miles and work under way on 11 miles; Albina, Ore., to Mock Bottom, 1.25 miles, grading has been finished.

Des Chutes Railroad, from Des Chutes, Ore., to Redmond, 133 miles, track laid on 21.11 miles, grading finished on 56.89 miles and grading work under way on 55 miles. (See report of this company elsewhere in these columns.)

Vandalia Railroad.—An officer writes that this company has made surveys and plans for double-tracking the St. Louis division between Indianapolis, Ind., and St. Louis, Mo. In one or two places the plans call for a revision of line, and in a number of places a reduction of grade. The company is building this year about 22 miles of second-track between Montrose, Ill., which is about 11 miles east of Effingham, and Altamont, about 11 miles west. This section does not require any revision of line and very little change in grade. There will be two reinforced concrete arch bridges, one near Salt creek, about one mile east of Effingham, to consist of one 50-ft. and two 40-ft. arches for double-track, and another bridge over Little Wabash river, about three miles west of Effingham, to have one 80-ft. and two 60-ft. spans. It is uncertain when any additional second-track work will be started. (Oct. 28, p. 811.)

Visalia (Electric).—Work on a line north to Woodlake, Cal., is expected to be finished during November.

Willapa Harbor & Coast Line.—This company was recently organized in the state of Washington, with $10,000,000 capital and office at South Bend, Wash., to build from Portland, Ore., north, crossing the Columbia river into Oregon, thence crossing the Willapa river to Willapacific, and via Brooklyn, in Pacific county, to Tacoma. The plans also provide for building a branch from a point on Willapa river, west via Raymond and South Bend. Right-of-way has been secured on about 20 miles. Steam will be used for the motive power on the main line, and electricity will probably be used on the branch via South Bend. Charles E. Miller, general attorney, South Bend. (Oct. 28, p. 811.)

FOREIGN RAILWAY NOTES.

The petition of Engineer Alexandre Martins Rodrigues and others, applying for a concession for building a railway between Cuyaba, South America, and Porto de Itaiatuba on the River Tapajos, with a branch to Bolivia, has been passed on by the Federal Chamber of Deputies to the Committees of Public Works and Finance.

Señor Claro Liberato de Macedo, notary, of Sao Paulo, South America, has petitioned the Senate for a concession and privilege for himself, or for a company which he will organize, to build, work and maintain a meter gage railway, which, starting from Sao Paulo, and passing through Piracaia, Pouso Alegre and Machado, shall terminate at Campo Bello, in Minas, with power to extend and to build branches.

Railway Financial News.

Atchison, Topeka & Santa Fe.—At the annual meeting it was announced that there were 28,000 stockholders, an increase of 3,000 since the previous annual meeting.

Central New England.—The New York Public Service Commission, Second district, has given permission to the Central New England to make a mortgage for $25,000,000 to secure 4 per cent. 50-year bonds, of which the company may issue immediately $12,317,000 bonds for refunding purposes.

Chicago Great Western.—The New York Stock Exchange has listed $2,000,000 additional first mortgage 4 per cent. bonds of 1909-1959. These bonds are part of the $9,500,000 reserved under the reorganization plan for betterments and improvements during the first two or three years of the existence of the new company.

Gettysburg & Harrisburg.—The Hunter's Run & Slate Belt Railroad, running from Pine Grove Furnace, Pa., to Hunter's Run, 8 miles, has been turned over to the Gettysburg & Harrisburg and will hereafter be operated by that company.

Hunter's Run & Slate Belt.—See Gettysburg & Harrisburg.

Michigan Central.—This company has sold to Morgan, Harjes & Co., Paris, France, 50,000,000 francs ($10,000,000) one-year 4½ per cent. debenture notes, unsecured by collateral. The price at which these notes were sold was not made public, and the financial papers have variously estimated the cost of this money to the Michigan Central all the way from 4¾ per cent. to 9 per cent.

Norfolk Southern.—Judge McLemore has dismissed the bill of the Zell-Van Dyke syndicate, which tried for the fourth time to prevent the issue of securities of the new company and to hold up the transfer of the property of the old Norfolk & Southern to the new Norfolk Southern company.

The Norfolk Southern has sold to the Central Trust Co., New York, $4,460,000 one-year 6 per cent. notes, the proceeds of these notes to be used to pay $1,980,000 collateral trust notes; $1,442,865 receiver's certificates; $47,000 Raleigh & Pamlico Sound bonds; $50,000 Suffolk & Carolina bonds; bills payable, amounting to between $100,000 and $200,000, and the expenses of the reorganization committee. The $5,780,000 first mortgage 5 per cent. bonds which it is planned to issue as soon as the present litigation against the company is settled are deposited as collateral for the notes.

St. Louis & San Francisco.—See comments on the annual report of this company elsewhere in this issue.

St. Mary's & Western Ontario.—In accordance with the requisition made by holders of one-half or more of the second mortgage bonds, a meeting of bondholders is to be held to consider what steps shall be taken in view of the default of the company to pay interest on these bonds. The road runs from Embro, Ont., to St. Mary's, 16 miles, and it is leased to the Canadian Pacific at a rental of 40 per cent. of gross earnings.

Union Pacific.—See comments on the annual report of this company elsewhere in this issue.

Western Pacific.—The following were elected directors at the annual meeting held October 25: E. T. Jeffery, George Gould, W. J. Shotwell, C. H. Schlacks, Edwin Hawley, Warren Olney, S. C. Matthews, F. W. McCutcheon, Warren Olney, Jr., A. H. Calef, J. F. Evans, Charles W. Slack, C. M. Levey.

Wilmington, Newcastle & Southern.—The sale of the line between Wilmington, Del., and Newcastle under the first mortgage of the Wilmington & Newcastle Railway has been ordered. The sale does not include the line from Newcastle to Delaware City.

Negotiations between a syndicate of American bankers and the Chinese government for a loan of $50,000,000 have, it is understood, been concluded, and a syndicate of bankers, including J. P. Morgan & Co., Kuhn, Loeb & Co., the National City Bank and the First National Bank, all of New York, have agreed to take $50,000,000 5 per cent. 45-year bonds at a price said to be in the neighborhood of 95. The bonds are an obligation of the Chinese government and the proceeds are to be used for currency reform, promotion of industrial development and the building of state railways.

Supply Trade Section.

The Chicago Bearing Metal Company, Chicago, announces the appointment of H. H. Hiland as general sales agent, effective October 15.

F. E. Lister, for the past two and one-half years an associate editor in the mechanical department of the *Railway Age Gazette*, has resigned to become eastern manager, with office at No. 1 Broadway, New York City, of *Municipal Engineering*, Indianapolis, Ind.

William C. Cuntz, previously mentioned in these columns as successor to E. Stütz, vice-president and general manager of the Goldschmidt Thermit Company, New York, will be general manager and treasurer of the company. Dr. F. H. Hirschland has been elected vice-president.

Ferro-lithic plate, consisting of dove-tailed cross-ribbed steel sheets which act both as form and reinforcement, was specified for the ceiling construction of the second floor of the new Chicago, Rock Island & Pacific station building at Kansas City, Mo. This ferro-lithic plate is made by the Berger Manufacturing Company, Canton, Ohio.

The National Bolt & Nut Company, Pittsburgh, Pa., manufacturers of "National" hot pressed nuts, has given contracts for new buildings and machinery for a plant to make cold punched nuts. The equipment will consist of one 150-h.p. Miller improved gas engine, several Pawtucket nut presses, National nut tappers, machine shop tools, etc. The present plant has a capacity of 75,000 kegs of hot pressed nuts per year, and the additional buildings will make this the largest nut works in Pittsburgh.

Frederick F. Fitzpatrick, vice-president of the Railway Steel-Spring Company, New York, was elected president on November 1, succeeding William H. Silverthorn, deceased. Mr. Fitzpatrick, who had spent some ten years in the operating department of the Missouri Pacific, was appointed St. Louis representative of the Charles Scott Spring Company (now a part of the Railway Steel-Spring Company) in 1898. In 1905, three years after the formation of the Railway Steel-Spring Company, he was made general sales agent, with headquarters in New York; and was elected a vice-president, in charge of sales, in 1906. Scott R. Hayes, whose identity with the railway spring business dates from 1900, when he was chosen to represent the Charles Scott Spring Company in Chicago, succeeds Mr. Fitzpatrick, as vice-president. Mr. Hayes has been connected with the sales department of the Railway Steel-Spring Company in New York since 1902, for the last seven months as general sales agent. Both promotions are well deserved and are good examples of the civil service that Jules French, now chairman of the board, has consistently applied to those responsible for the success of the Railway Steel-Spring Company.

F. F. Fitzpatrick.

TRADE PUBLICATIONS.

Batteries.—The Electric Storage Battery Company, Philadelphia, Pa., has issued bulletin No. 125, containing a description of installations of the chloride accumulator on the system of the Gulfport & Mississippi Coast Traction Company. Also bulletins Nos. 126 and 127, the former being devoted to this company's type of oil insulator for installing battery tanks and the latter being a description of a number of its automatic regulating apparatuses.

Pneumatic Tools.—The Chicago Pneumatic Tool Company, Chicago, has issued a 100-page catalogue covering its line of pneumatic tools and appliances, and including considerable valuable data for users of these appliances. The book is printed on heavy glazed stock and is 6 x 9 in. in size.

Titanium in Iron.—The Titanium Alloy Manufacturing Company, Pittsburgh, Pa., has just issued a new booklet on the subject of Titanium in iron. The information in this booklet describes a process which is said to be entirely new in the treatment of iron with alloys, in that this alloy may be used through the cupola or through the air furnace to be melted down with the charge, making it far more simple and practicable for ordinary use than the ladle method, where the alloy may also be used, if desired.

RAILWAY STRUCTURES.

ARTHUR, ONT.—See Sudbury, Ont.

EDMONTON, ALB.—See Sudbury, Ont.

HARTFORD CITY, IND.—The Pennsylvania will build a $50,000 passenger station and a coaling and water station, the latter to be located one mile west of the city. Contracts have already been let and work has begun.

LOS ANGELES, CAL.—The Southern Pacific is making improvements to its wharf and sheds at Los Angeles harbor, San Pedro. The work will cost about $15,000.

MILWAUKEE, WIS.—Plans are being made by the Chicago, Milwaukee & St. Paul for a new passenger station to be built in Milwaukee. It is estimated that the cost of the new station, together with the changes which will be necessary in the yards, will amount to $2,000,000.

NEBRASKA CITY, NEB.—The Chicago, Burlington & Quincy has asked the council to close South Sixth street to allow them to begin work on a $40,000 passenger station at the foot of that street. The railway company agrees to build a subway under their tracks at Ninth street if Sixth street is closed.

NORTH ADAMS, MASS.—The Boston & Maine is to build an engine house for the electric locomotives which are to be used in hauling trains through the Hoosac tunnel.

SAN BERNARDINO, CAL.—The Atchison, Topeka & Santa Fe will enlarge the pre-cooling plant at San Bernardino, at a cost of $150,000. The present capacity of 128 cars in 24 hours is to be increased to 192 cars.

SPOKANE, WASH.—The Chicago, Milwaukee & St. Paul and the North Coast are preparing independent plans for a union passenger station with a view to harmonizing the ideas of the two companies and reaching an early agreement.

SUDBURY, ONT.—The Railway Commissioners of Canada have authorized the Canadian Pacific to build a bridge over Little Key river, on the Lake Superior division, Sudbury subdivision; a bridge over Pincher creek, on the Alberta division, Crow's Nest subdivision, and a bridge over the North Saskatchewan river, at Edmonton, Alb. The commission has also approved the location of the proposed station to be built at Arthur, Ont.

TOPEKA, KAN.—Fire in the yards of the Atchison, Topeka & Santa Fe destroyed between 600 and 700 freight cars on October 28. The big shops were saved after a hard fight. The loss is variously estimated at $500,000 to $800,000.

TYLER, TEX.—The St. Louis Southwestern is building additions to its machine shops at Tyler, at a cost of $300,000. It is expected that the work will be finished soon. The company is also installing an electric light and power plant.

WILKESBARRE, PA.—The county commissioners have given a contract for building the new river bridge to connect Plymouth and Breslau to the Penn Bridge Co., Beaver Falls, at $276,973. The structure is to be of steel and concrete and is to carry tracks for electric surface lines.

Late News.

The items in this column were received after the classified departments were closed.

Stillman W. Robinson, professor emeritus of mechanical engineering at the Ohio State University, died of heart disease on October 31.

Morris & Company have ordered 200 beef cars from Haskell & Barker. These cars will have the same specifications as the cars placed last June.

The Dold Refrigerator Car Line, reported in the *Railway Age Gazette* of September 2 as being in the market for 50 steel underframe refrigerator cars, has ordered this equipment from the American Car & Foundry Company.

By a very large majority the minority stockholders of the Northern Central voted conditionally to accept the offer of the Pennsylvania Railroad, the majority stockholder, to lease the Northern Central for 999 years. (Aug. 12, p. 295.)

At a special meeting of Boston & Maine stockholders at Lawrence, it was voted to authorize directors to issue $10,663,700 new stock, to be offered to stockholders at $110 per share, subject to approval of the railway commissioners. The issue of $10,663,700 new stock gives both common and preferred stockholders the right to subscribe to one new share for each three shares now held. There is at present outstanding $28,841,690 common and $3,149,800 preferred stock.

Frank B. Harriman, former general manager of the Illinois Central; John M. Taylor, former general storekeeper, and Charles L. Ewing, former general superintendent of northern lines at Chicago, have been bound over to the Grand Jury by Municipal Judge Mancha Bruggemeyer, of Chicago, on the charge of being parties to a conspiracy to obtain money by false pretenses. Their bail was placed at $10,000 each. The bonds for each one of the defendants were furnished by Henry B. Smith, an insurance agent.

Indictments have been returned by the Federal Grand Jury charging the Hocking Valley Railroad and the Sunday Creek Coal Company with discrimination in violation of the interstate commerce law. The Hocking Valley was indicted on twenty-eight counts, and the Sunday Creek company on nine counts. At the request of District Attorney Day bond was fixed at $5,000 on each indictment. The charge against the Hocking Valley is the extension of unlimited, unsecured credit to the Sunday Creek Coal Company, while demanding cash payment and security on prepaid freight bills from all other shippers. It is charged in the indictments that since 1903, when the Hocking Valley took over the Sunday Creek company, the coal company's freight bills have been allowed to accumulate until they have reached a total of $2,445,000. The government further charges that the Sunday Creek Coal Company instead of paying its freight bills in cash issued notes to the amount of $2,445,000, and that in April, 1910, the coal company substituted 5 per cent. debenture bonds, due in 1913, for these notes.

The New York State Public Service Commission has completed the compilation of the 77 bids which were received for the Tri-Borough Subway. The total of the lowest bids is $85,437,570. The figures for route 5 (Lexington avenue) were $59,746,656; for route 9 (Broadway-Lafayette avenue, Brooklyn) $11,924,539; for route 20 (Canal street) $13,766,554. Awards will be made by the commission about the middle of December. The engineers have not yet completed their examination of the bids to see whether any of them are unbalanced. The invitation to bidders sent out by the commission last spring provided expressly that the unit prices must not be improperly balanced, and that any bid which the commission should consider detrimental to the city's interests on that account would be rejected. Under the unit system of bidding almost a hundred items had to be bid on separately. "Unbalanced bids" are those which make it appear that they are lower than they will turn out to be after the work is completed.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Seaboard Air Line is in the market for 10 freight locomotives.

The Detroit, Toledo & Ironton has ordered 12 locomotives from the American Locomotive Company.

CAR BUILDING.

The Atlanta & West Point is in the market for 100 box and 100 flat cars.

The Lehigh Valley has ordered 15 milk cars from the Standard Steel Car Company.

The Bellingham Bay & British Columbia is in the market for two passenger coaches.

The Swift Refrigerator Transportation Company is considering building 250 beef cars.

The Armour Car Lines have secured material for building 200 refrigerator cars in company shops.

The Seaboard Air Line is asking prices on 10 coaches and three combination baggage-express cars.

The Lake Superior & Ishpeming is asking for prices on 100 all-steel ore cars, which is a revival of an inquiry issued several months ago.

Street's Western Stable Car Line has been securing specialties for rebuilding old cars and replacing destroyed equipment, but no new cars are to be built.

The Canadian Pacific, reported in the *Railway Age Gazette* of October 14 as being in the market for 50 tank cars, has ordered this equipment from the Pressed Steel Car Company.

The Havana Central, reported in the *Railway Age Gazette* of September 16 as being in the market for three baggage and six passenger cars, has ordered this equipment from the American Car & Foundry Company.

The Richmond, Fredericksburg & Potomac, reported in the *Railway Age Gazette* of September 30 as being in the market for 25 box cars, is said to have decided upon building this equipment in its own shops. This item is not confirmed.

The Delaware, Lackawanna & Western, reported in the *Railway Age Gazette* of October 14 as being in the market for 500 box and 500 hopper cars, has ordered 500 box and 250 hopper cars from the American Car & Foundry Company and 250 hopper cars from the Pressed Steel Car Company.

MACHINERY AND TOOLS.

The Wabash, reported in the *Railway Age Gazette* of July 29 as in the market for a list of machine tools, has revised this inquiry and the order will probably be placed soon.

IRON AND STEEL.

The Pennsylvania is reported to have ordered 5,000 tons of rails.

The Lehigh Valley has ordered 300 tons of bridge steel from the Phoenix Bridge Company.

The Erie has ordered 3,500 tons of rails from the Carnegie Steel Company for prompt delivery.

The Louisville Railway Company has ordered 500 tons of rails from the Carnegie Steel Company.

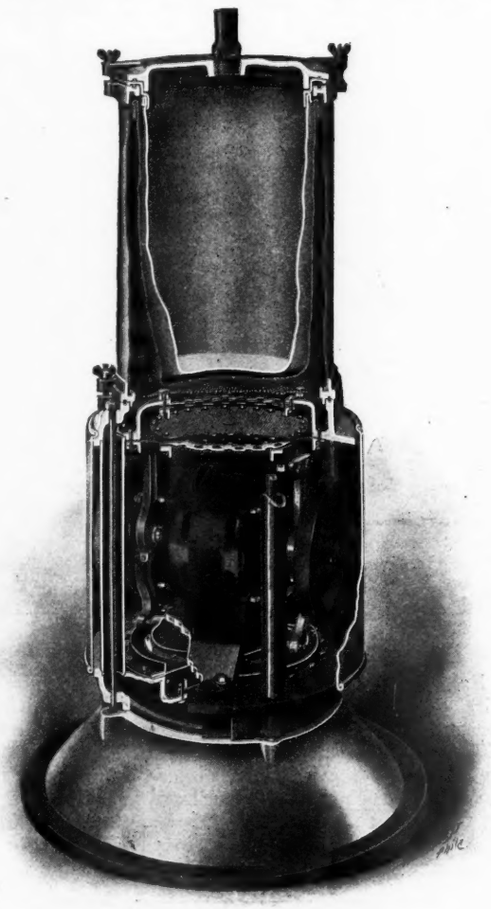
The New York, Westchester & Boston, reported in the *Railway Age Gazette* of October 21 as in the market for 2,000 tons of structural steel, has ordered this material from Milliken Bros.

The Long Island, reported in the *Railway Age Gazette* of September 30 as in the market for 12,000 tons of structural steel, has ordered this material from the Fort Pitt Bridge Works.

The Atlantic Coast Line has ordered 15,000 tons of rails from the Pennsylvania Steel Company, in addition to an equal tonnage from the Tennessee Coal, Iron & Railroad Company, reported in the *Railway Age Gazette* of October 14.

Duplex Stationary Vacuum Cleaner.

The stationary vacuum cleaner, shown in the photograph, is intended as a permanent plant especially for use in buildings, such as railway offices, station buildings, etc. It is also applicable for installation in coach cleaning yards, by placing the stationary cleaner in a small building within the yard and running the piping in conduits alongside of the coach cleaning tracks.



Keller Duplex Stationary Vacuum Cleaner.

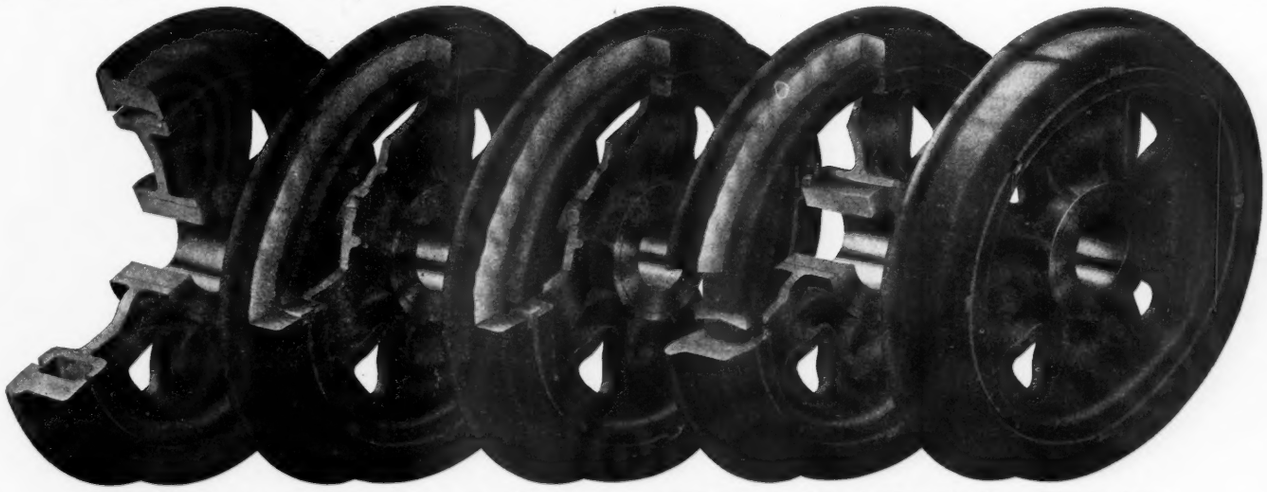
When used in railway office or station buildings the cleaner is permanently located in the basement or in a small closet. The electric motor is controlled by a system of wiring which leads from it to push buttons in the various rooms. The dust bag, as shown in the illustration, is located in the upper portion of the cleaner and the dust is led into it through a system of iron piping placed within the walls. There is an elbow connection, 6 in. above the floor in each room, to the piping system, and the hose carrying the cleaning nozzle is plugged into this connection. It is, therefore, only necessary to carry to the room a length of hose sufficient to reach all parts of it. As is the case with vacuum cleaning machines, the capacity of this one decreases as the length of the hose increases. It is therefore recommended that a sufficient number of risers be installed in the walls to permit reaching all places to be cleaned with a maximum length of 33 ft. of hose. This fact should be considered when it is intended to clean several rooms from one piping inlet. It is desirable, also, to have the piping as short as possible, but satisfactory results are assured with as much as 100 ft. of piping when 1¼-in. pipe is used.

The illustration shows the position of the ¼-h.p. electric motor, which will produce 40 cu. ft. of free air per minute and a vacuum of from 8 in. to 9 in., with a consumption of not more than 325 watts. This is said to be made possible through the use of a straight line principal and the elimination of chains, belts, gears, cranks and levers, the power of the motor being applied directly and in straight line with the moving parts, and without the intervention of any friction producing parts, except the ball bearing eccentrics and the two motor bearings. Due to the motor being supported midway between the operating parts and in a straight line with them, and to the peculiar construction of the machine whereby the load is balanced, the wear on the motor bearings is uniform throughout. By means of large oil cups using special grease, the machine may be operated for several months without the slightest attention.

This cleaner is manufactured by the Keller Manufacturing Company, Philadelphia, Pa., under broad basic patents. It is also licensed under the fundamental Kenney patents.

New Steel Tired Wheel.

A steel tired wheel, known as the McConway wheel and intended for use in both steam and electric service, has been placed on the market by The McConway & Torley Company, Pittsburgh, Pa. It is steel tired and of the built-up type; the wheel center is a steel casting, the hub is cast iron, and the tire is of the usual rolled steel type. There is no machine work on the tire except such rough turning as may be necessary to bring it to a round; for the wheel centers, a small amount of grinding and rough turning only is required. There are no bolts, and the tire is neither fused nor shrunk on; it cannot come off by reason of any degree of expansion, and will not turn on the center. Separation of the two members, for the renewal of the tire, is effected by cutting the tire in two places, whereupon the structure falls apart, leaving the center ready for the immediate application of a new tire. The application of the new tire may be made by unskilled labor and requires no special machinery; a foundry cupola and lifting appliances adequate to handle units of the full weight of a car wheel are the only devices required in the way of machinery, which means that any ordinarily equipped foundry affords the required facilities for the work. The first wheels of this type were assembled



View Showing the Construction and Method of Assembling the New McConway Steel Tired Wheel.

with the use of a portable cupola, melting one ton per hour.

The construction and assembling of the wheel are shown on the accompanying illustration. The view at the left shows the tire, center and hub assembled. The cast steel center is shrunk on the cast iron hub. As may be seen there is a considerable open space between the periphery of the center and the inner face of the tire. This space is divided into eight segments by spacing wedges, which are used to temporarily adjust the tire and center and hold them together. The wheel is then laid flat and molten iron is poured through the annular opening on the side. The center is so shaped on its periphery that the eight cast iron sections thus formed, known as permanent locking wedges, form four sets of wedges with points opposed. The second view from the left shows a pair of these locking wedges with the temporary spacing wedges still in place. As the metal in the locking wedges cools, it shrinks. The spacing wedges are then removed and the locking wedges are driven home until the opposing points of each set practically, although not quite, come in contact, as shown in the third or middle view in the illustration. This leaves four large spaces between the large ends of the different sets of wedges. At these enlarged spaces are sprag notches in the inner flanges of the tire, into which steel sprags are fitted and final closers are cast in place, thus completing the circle of locking wedges, which are practically under the same compression as if the tire was shrunk on. The sprags imbedded in the circle of cast iron wedges, one of which is shown in the fourth view from the left, engage the tire at the notches in the flanges, preventing it from turning. The completed wheel is shown at the extreme right in the photograph.

Commercially considered, the first cost of the initial wheel of this design is the value of the tire, the cast steel center, the cast iron hub and the cast iron locking wedges. Renewals of the initial wheel mean the purchase of new tires only. The salvage in the scrap value of the old tire is more than enough to remelt the locking wedges and attach the new tire to the old center, which is itself indestructible. The salvage from the old tire will pay the cost of the removal of the wheel and its return to the axle, which reduces the computation of the cost of wheel renewals to the price of a new tire. The makers of the wheel frankly state that: "With the economic value of steel tires, as compared with other forms of wheel construction, it is not our purpose to deal at this time. What information we have on the subject is derived from the experience of railway men, many of whom confess frankly that they have yet much to learn. The relative endurance of steel tires of different makes is not a new question, it is probably as old as the steel tire itself. Not being makers of steel tires, it is not our province to enter into a discussion of that feature; what we are now proposing to do is to furnish the mounting for a steel tire which will carry it through its lifetime and serve the same purpose for its successors, indefinitely, and we reckon it to be no small matter that so large a percentage of wheel tonnage should be always at par as is the case with the form of construction that we offer."

Buckwalter Electric Baggage Trucks.

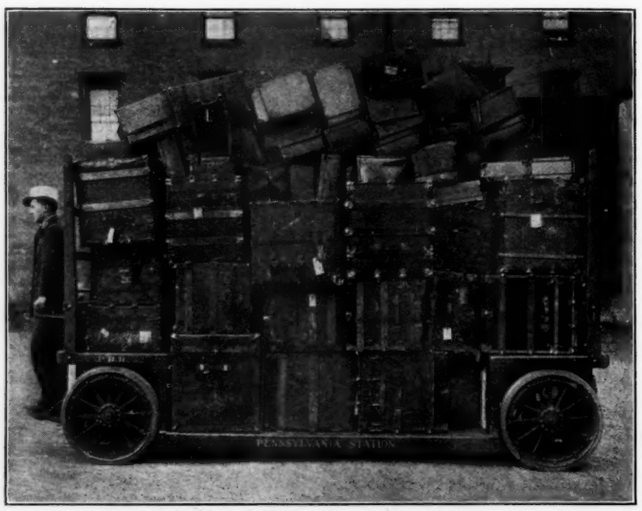
The principal feature of the Buckwalter electric baggage truck is the use of double end control, which embodies a folding platform for the operator and sockets for controller and steering handles at each end, so that the truck can be operated with equal facility in either direction, thus avoiding the necessity of turning on narrow platforms or runways. The baggage porter stands on a platform at the end of the truck which happens to be pointed toward his destination. He simply plugs in the steering and controller handles in their proper sockets, and the truck is ready for operation.

A small platform is hinged at each end of the truck, the two being connected so that the operative position of the one involves the closing of the other. Allowing the operator to ride enables the truck to be operated at two or three times the speed of a hand truck, and conserves his energy for transferring of baggage at his destination. As he stands squarely on both feet and leans against the end standards of the truck he has positive control of the steering apparatus.

The four-wheel steering arrangement enables the truck to be turned in a very small radius, as compared with its size, permitting it to be operated safely in narrow passage ways. This also has the advantage that the driver need only see that the front end of his truck clears a column or other obstruction, as the then rear end tracks with the front.

The tread of the wheels is widened so that the wheels are just within the protection of the side sills; and a special form of steering knuckle was developed to reduce hub projection to within the rim of the wheels, which still further reduces the possibility of collision with railway equipment, columns or other trucks. The sockets for the controlling apparatus do not project beyond the rear end of the truck, which reduces the liability to damage on elevators.

The truck is constructed on the four-point support principle to provide for the greatest stability to reduce throwing of bag-



Drop Frame Type; Buckwalter Truck.

gage. Each wheel carries its quota of weight on account of the flexibility of frame construction. The storage batteries and motor are flexibly suspended from the frame to reduce vibration. The latter is geared through heavy double reduction spur gearing directly to the wheel rims. The controller is operated directly from either end of the truck and provides three speeds, namely, two, four and six miles an hour in either direction. The brakes are likewise operated from the driver's platform from either end of the truck and operate on the trailing wheels. The

Straight Frame Type; Buckwalter Truck.

brake shoes are of the internal expanding type, bearing directly on the wheel rims, and develop about twenty times the braking power it is possible to get with a hand truck. The brakes may be applied by foot pedal from either of the operators' platforms, and also are applied automatically when the driver steps off the platform. The brake is also connected to open the electric circuit when the driver leaves the truck or applies the brake.

The trucks are built in two types. The straight frame type is intended for stations where the platform is approximately on a level with the rails. Twelve of these trucks are in service

at the Jersey City station of the Pennsylvania Railroad; they have a capacity of 4,000 lbs. each, and weigh approximately 2,400 lbs. Twelve trucks of a similar model are in use at the Washington terminal.

The drop frame trucks are intended for stations having depressed tracks, and, as the height of these trucks is only nine inches, the truck floor is approximately on a level with the baggage car floors, which reduces the labor of handling baggage to a minimum. Twenty-five of these trucks are in use at the new Pennsylvania station at New York City and a like number are on order. Three are in use at the Grand Central station, New York City.

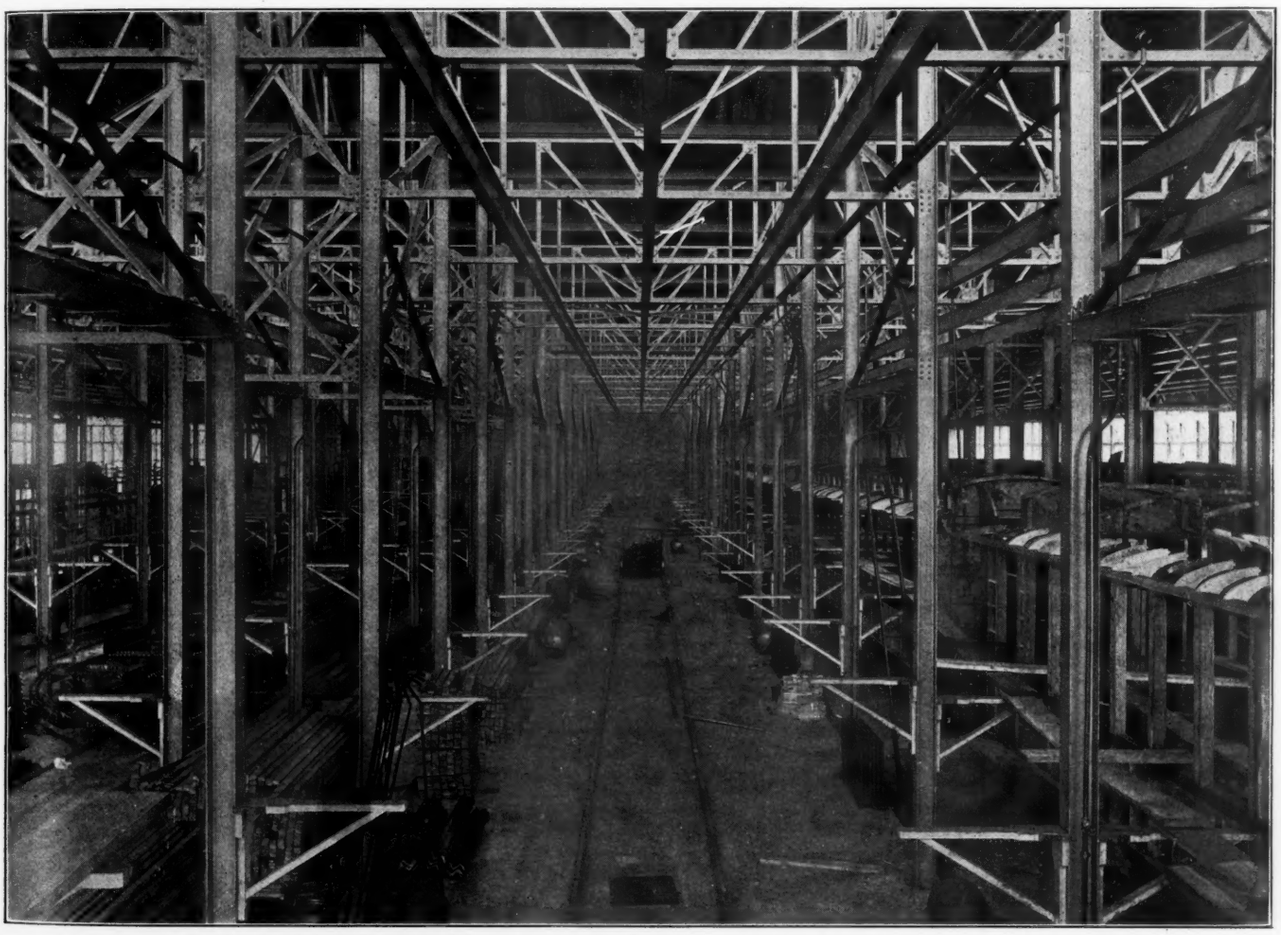
The saving of labor due to these trucks varies with the service. In the ordinary passenger station the saving amounts to two or three men per truck, while another of the trucks in shop service at Altoona has replaced four men. Their greatest value lies in the expedition with which baggage is handled, as the time between the baggage room and the trains is more than cut in half, while the fact that the operator arrives at the train in fresh physical condition enables him to unload his truck very quickly. Baggage masters estimate that delays to trains for baggage have been reduced from three to ten minutes since the introduction of these trucks. Since using these trucks it has been found that the baggage departments can get along and handle their work during rush periods, as occur in the spring vacation season, Labor Day and holidays, without taking on "green" men from other departments, which, by maintaining the baggage organization intact, reduces the delays and misunderstandings with the public, due to mistakes in improperly forwarding baggage, while at the same time effecting a considerable reduction in the wages of the extra men.

The double end baggage trucks were designed and patented by T. V. Buckwalter, Altoona, Pa., and are manufactured by the Elwell-Parker Electric Co., Cleveland, O. L. C. Brown, 50 Church street, New York City, is sales manager for the latter company, and to him all inquiries should be addressed.

Harlan & Hollingsworth New Car Shop.

The Harlan & Hollingsworth Corporation, Wilmington, Del., has recently placed in operation a new car shop, No. 3, illustrations of which are shown. The building was erected by Fred A. Havens & Company, Philadelphia, Pa., under the supervision of G. R. Henderson, mechanical engineer, New York.

The building is 172 ft. wide by 300 ft. long, being designed to accommodate 32 of the largest passenger coaches and having 2,400 ft. of trackage. A pile foundation, topped with heavy concrete caps, supports the reinforced concrete girders, beams and the floor. The frame of the superstructure is of steel construction, enclosed on all sides with expanded metal plastered wall and separated from the adjoining building with a brick fire wall. It was the aim of the architect to afford a liberal allowance for natural light and the sides of the building are, therefore, provided as far as possible with glass sash and the roof with 10 lines of saw-toothed skylight, at close intervals, all of which operate and afford liberal ventilation and light. Three sides of the building have windows and doors, affording extensive glass area. Artificial lighting is provided by Cooper-Hewitt lamps.



Interior of New Car Shop.

The plant is equipped for pneumatic drilling and riveting, while for the operation of assembling cars there is an equipment of trolley beams, which carry electric hoists, enabling quick transportation of parts to all points in the building. Lengthwise the shop is divided into 20 panels 15 ft. long. The center longitudinal section is 83 ft. wide and is divided into a 6-ft. 8-in. panel in the center and two 19-ft. panels on each side. The two side sections are divided into inner panels, 6 ft. 8 in. wide, and two outside panels 19 ft. wide. In the center of each of these panels is a track, running the full length of the building from the 13-in. brick fire wall on the south end out through the large doors at the north. The interior illustration shows one of these center tracks, the photograph being

Harlan & Hollingsworth Car Shop No. 3.

taken looking in the direction of the brick wall. In each of the 19-ft. panels and secured to the overhead trusses are three 12-in. I-section trolley tracks, running the full length of the building. These are used in connection with chain hoists, in assembling the cars under construction.

The window frames on the east and west sides extend from column to column, and are 15 ft. long by 15 ft. high, consisting of nine sashes containing 12 lights each. The window frames in the saw-tooth roof also extend from column to column and consist of four frames, 7 ft. by 19 ft., and one frame 7 ft. by 6 ft. 8 in., there being three sashes in the 19-ft. frames and one sash in the smaller frame.

The entrances to the building consist of two small doors, 4 ft. by 7 ft., on both the east and west sides, and of the large doors at the end of each of the panels on the north side. There are also three material track entrances on the north side, one between each pair of large doors. The sides of the saw-teeth and the rest of the outer walls not taken up by window or door openings are covered with 2 in. of plaster on metal lath.

The yellow pine piles in the foundation are driven to a solid bottom. Each column is supported by two piles with a concrete cap, 2 ft. x 4 ft. x 2 ft. 3 in. high, and the tracks and floor slab by piles with 2-ft. x 2-ft. x 2-ft. 3-in. caps. A total of 1,195 piles were driven having 252 2-ft. x 4-ft. x 2-ft. 3-in. caps, and 691 2-ft. x 2-ft. x 2-ft. 3-in. caps, requiring in all about 252 cu. yds. of concrete.

The net-work of beams and girders supporting the floor and car tracks varies but slightly in size and reinforcement. The girders supporting the track beams are 12 in. wide by 28 in. deep, and are reinforced by four ⅞-in. square bars. The track beams are 8 in. wide by 26 in. deep and are reinforced with three ¾-in. square bars. All other beams are 12 in. x 26 in., reinforced with four ¾-in. square bars. In all 955 cu. yds. of concrete were required for the beams and girders. The concrete floor supported on these beams and girders is a slab 172 ft. x 300 ft., and varies in thickness from 4 in. to 7 in. It is reinforced with ½-in. bars, placed 6 in. center to center, with additional ⅜-in. square bars placed between these in that portion of the floor slab between the track beams and girders. The total amount of concrete required for the floor was 872 cu. yds. A total of about 2,270 cu. yds. of concrete and 163 tons of reinforcement were required for the whole building. About 550 tons of structural steel were used in the entire building. The roof purlins consist of 6-in. channels on the flat portion and 10-in. channels on the saw-toothed section. These are bolted to the roof trusses, which are built up of angles and plates. The columns supporting the roof and the 12-in. trolley tracks are of the new Bethlehem H-sections.

Metal Curtain Roller.

The Rex all-metal curtain roller, which has been subjected to the hardest kind of shop and service tests and is the only one ever put on the market in whose construction no wood is used, is manufactured by the Curtain Supply Company, of Chicago. All the parts are made by dies and are uniform and correct. Special machinery has been designed and made to manufacture the barrels, springs, mandrels, bungs, end pieces, brackets, etc. The roller barrel is closed by a seam, as illustrated in Fig. 2, instead of being soldered in the usual manner. This seaming process produces a barrel of uniform diameter, allowing the curtain to be wound up evenly. It also prevents the barrel from opening at the joint. The pressed metal end caps and pins give assurance that the end pins will always remain at the center of the barrel, and as the pins are part of the end piece, they cannot get out of alinement. This construction allows the roller to revolve on its axis and eliminates all wobbly motion. On account of its peculiar construction, the groove (Fig. 2) is never clogged with solder, and has a round instead of a sharp edge. The grooves also mate and match perfectly, rendering it easy to apply the curtain to the roller.

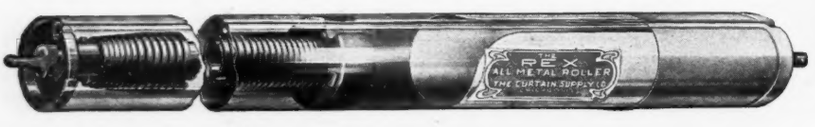


Fig. 1.

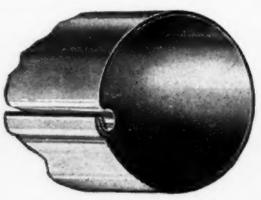


Fig. 2.

Fig. 3.

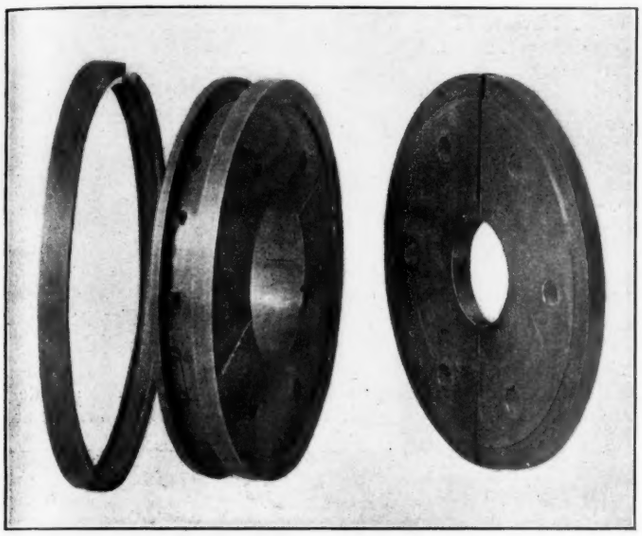
"Rex" All-Metal Curtain Roller and Parts.

The plug ends are made of metal with spring extensions which bear against the inside of the roller barrel (Fig. 1), and produce an even and smooth holding adjustment, at the same time permitting the roller to be readily lengthened or shortened; avoiding, also, all swelling or shrinking as with the wooden plug. The mandrel is made of hollow metal and is strong and designed to prevent breakage. The metal bung affords a durable and smooth working bearing and is stronger than the ordinary wooden bung. The springs are made on specially designed machines, out of drawn wire and made according to this company's own specifications as to temper and size. The springs are stronger than the usual spring and have more coils, making less variation than usual in the spring ten-

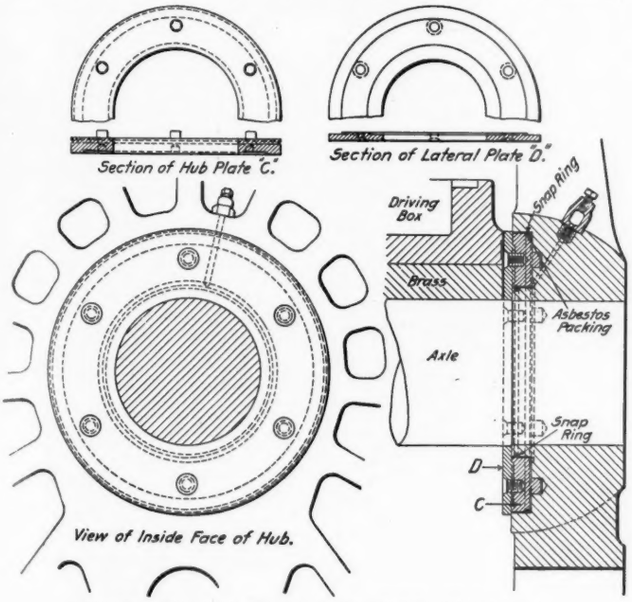
sion when the curtain is at the top and bottom of the window. The Rex brackets are made of pressed metal and are therefore strong and uniform. The rollers are made in all lengths and of standard diameters, the strength of the barrel and spring being adapted to the special size and use intended.

Smith Locomotive Adjustable Hub Plate.

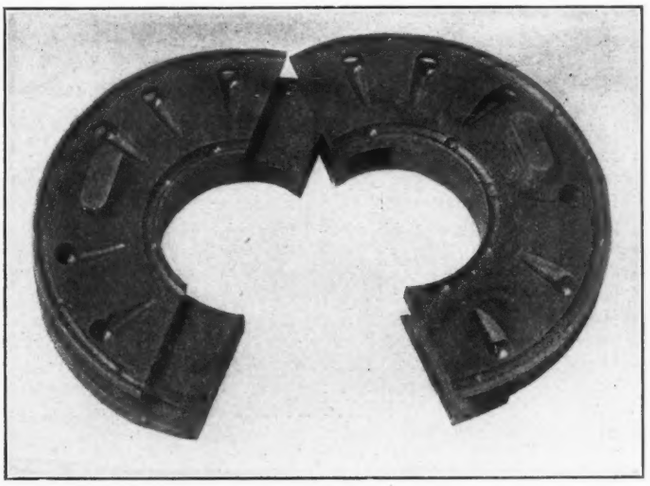
The purpose of the hub plate here illustrated is to prevent excessive lateral motion and thus avoid the wear of the locomotive machinery, and, to some extent, the wear of the track. The plate consists of a ring which fits in a recess in the hub of the driving wheel and has a packing ring, so that it has a tight piston fit. The hub plate is held against the driving box by pressure obtained by the use of heavy grease behind the plate, the pressure being controlled by a screw plug. By increasing the amount of grease, the plate may be adjusted to any position to take up the lateral motion, thus making it, as the name implies, an adjustable hub plate. The quality of grease used is commonly known as pin grease. The packing rings prevent any possibility of the grease escaping and insure the plate remaining in proper position. It is found that a ⅞-in. counter bore in the wheel hub is sufficient for the average locomotive. The cavity affects the strength of the hub very little. With a full round plate it is, of course, necessary to press off one of the driving wheels in order to apply, but with the sectional plate here illustrated this is not necessary. It has been found by experience that it takes a mechanic from 10 to 15 minutes with a grease filling cup to adjust the plate to any position desired in case too much lateral motion is found. This adjustable hub plate is in use on locomotives on the Kansas City Southern. It was invented by F. H. Smith, president of the Smith Locomotive Adjustable Hub Plate Company, Pittsburg, Kan.



Smith Adjustable Hub Plate.



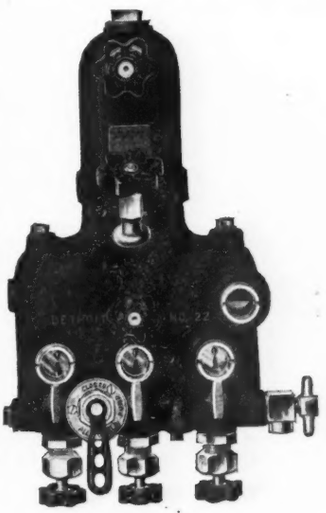
Application of Smith Adjustable Hub Plate.



Sections of Smith Adjustable Hub Plate.

Detroit No. 22 Bullseye Lubricator.

Owing to its reliability and the form in which the lubricant is delivered the hydrostatic lubricator has always been acknowledged as the ideal method of obtaining perfect lubrication for simple, compound or superheated locomotives, although its use in the old tubular glass form was attended with more or less danger to the operator. Consequently, the bull's-eye feature, insuring absolute safety, was received with favor by all railways whose managements desired to protect the employees and equipment against harm by the use of a safe, reliable and economical device. In designing the first bull's-eye lubricator, known as the Detroit No. 21, the paramount idea was safety, with simplicity and economy as secondary considerations. In the six years in which this device has been upon the market its safety has been demonstrated beyond question. In designing the Detroit No. 22, the safety features of the No. 21 have been retained and special attention has been given to greater economy and convenience of operation.



Detroit No. 22 Bullseye Lubricator.

The ability of the modern locomotive to do the work for which it was designed, its economy in fuel and cost of up-keep, as well as its hauling power, is dependent to a large extent upon the proper lubrication of its valves and cylinders. What, ten years ago, would have been considered satisfactory lubrication of the locomotives then in use is entirely inadequate for the large and more powerful locomotives of to-day. Modern lubrication means complete and perfect lubrication under every condition, and perfect lubrication cannot be obtained from a device that, at a time a locomotive is performing its heaviest duty, fails to deliver the lubricant. Neither can it come from a mechanically driven device where the quantity of lubricant per mile remains the same irrespective of the duty requirements.

To satisfactorily perform the work required of it a modern

lubricator should have certain essential features, most important of which is the ability to deliver the lubricant under all conditions and up to the full efficiency of the locomotive. It should automatically, through the decreased speed of the locomotive in heavy duty on grade, increase the amount of oil per mile and, on level track at higher speed return to the rate of feed required for that class of service. The ability to start or stop the device should rest with the operator and not be dependent upon the movement of the locomotive itself. Theoretically the idea of having the starting and stopping feature controlled by the movement of the locomotive is attractive but practically it does not permit of getting the oil to the valves and cylinders before the locomotive is in motion without additional manual labor on the part of the operator. The means for accomplishing this should be of such a character as will place within the hands of the operator the power to instantly stop, start or throttle the rate of feed, without disturbing the adjustment of the regulating valves, or the ability to withhold the lubricant from the valves and cylinders and allow the air pump feed to continue working. The duty of the modern air pump is so severe that it requires almost constant lubrication from the time it leaves a terminal to its return to the engine-house. It is therefore most important that the air pump feed be left working while the locomotive is temporarily at rest at a station or on a siding.

A modern lubricator should be so constructed that, having once adjusted the regulating valves for perfect lubrication in a class of service, these valves need not be disturbed or touched again until the class of service is changed. The importance of this as regards perfect lubrication, economy and convenience can hardly be overestimated. The introduction of an oil valve in the oil passage between the reservoir and the sight feed regulating valves in the Detroit No. 22 Bullseye lubricator, places in the hands of the operator an instantaneous means of starting, stopping or throttling the rate of feed, does away with the necessity of shutting off the feed regulating valves at a terminal, or in refilling on the road, and consequently the necessity of opening and readjusting these valves after refilling or at the commencement of a service movement. Under the old method of closing, opening and adjusting the regulating valves, the frequency with which this occurred not only shortened the life of the device, but the length of time consumed in this operation made it impractical to require the operator to shut off his cylinder feeds during temporary stops, with the result that much oil was wasted and the oil mileage decreased. This oil valve has a lever handle and index plate, and is so designed that from the "closed" position a half turn will open all feeds, or a quarter turn the feed to the air pump only, and vice versa.

In adjusting the feed regulating valves of a lubricator, the practice differs, the usual custom being to race the feeds and gradually throttle, which means a waste of oil on account of the cold condition of the steam chest and cylinders and the washing action of the heavily saturated steam during the initial movement. Another practice, attended also by decreased oil mileage and even more harmful results, is that of starving the valves and cylinders through insufficient lubrication, due either to error in judgment on the part of the operator as to the number of drops per minute at which he should set the feeds, or through not starting the lubricator in sufficient time before leaving the terminal. This practice will result in distortion of the valve motion through dry valves, waste of fuel, loss of time and speed and the necessity of racing the feeds in order to get the valves back into proper working condition. The use of the oil valve, the regulating valves having been once adjusted, makes the starting of the lubricator an instantaneous operation and insures the correct amount of lubrication. The operator knows that as soon as the lubricator has reached its proper temperature, the oil will feed at the rate required.

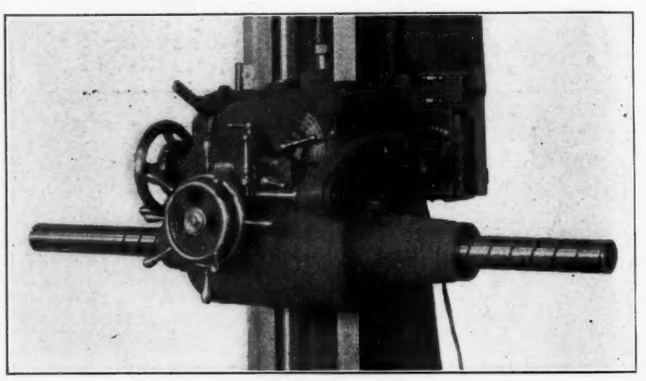
The adjustment of the lubicator feeds in night service or where the device is inconveniently located is always a matter of more or less difficulty. As the oil valve does away with the opening and closing of the regulating valves and the necessity for observing the sight feed features when starting and stopping the device, it becomes a great convenience to the operator, as under all conditions of service, night or day, he can by the sense of touch alone, place the lever handle of this valve in any one of its three positions. The Detroit lubricator is manufactured by the Detroit Lubricator Company, Detroit, Mich.

Shop Equipment.

Rochester Horizontal Boring, Drilling, Tapping and Milling Machine.

In the type of boring machine illustrated advantage is taken of the fact that it is easier to adjust the counterbalanced saddle carrying the boring bar and operating mechanism than it is to adjust heavy and irregular castings to a fixed bar. The special advantages, other than its compactness, rigidity, ease of operation, adaptability and capacity are as follows: All operations are controlled from one position, convenient to the work; continuous traverse of the spindle for any length may be obtained without resetting; the spindle is journaled in taper bearings located far apart and adjustable from the outside; all bearings are lined with phosphor bronze bushings provided with felt oil pads; wide range of speeds and feeds is provided to meet all requirements; rapid power traverse is available in all directions; and the machine is self contained, motor driven, and may be located regardless of the line shaft.

The motor is mounted on top of the column and drives the vertical splined shaft through rawhide gearing, transmitting power to the driving gears enclosed in the saddle. By this arrangement a high efficiency of transmission is obtained. All of the operating levers and hand wheels are located on the saddle within easy reach of the operator and convenient to the work. The machine may be started, stopped or reversed independent of the motor, the direction of rotation or stopping being controlled by a lever which operates friction clutches. The spindle is journaled in long phosphor bronze taper bearings located at



Detail of Spindle Saddle.

each end of the saddle and adjustable from the outside. It is driven by two large spline keys fitted in a sleeve on which the driving gear is mounted. This sleeve is journaled in separate bearings, clearance being provided between it and the spindle to eliminate any possible vibration from the driving gear.

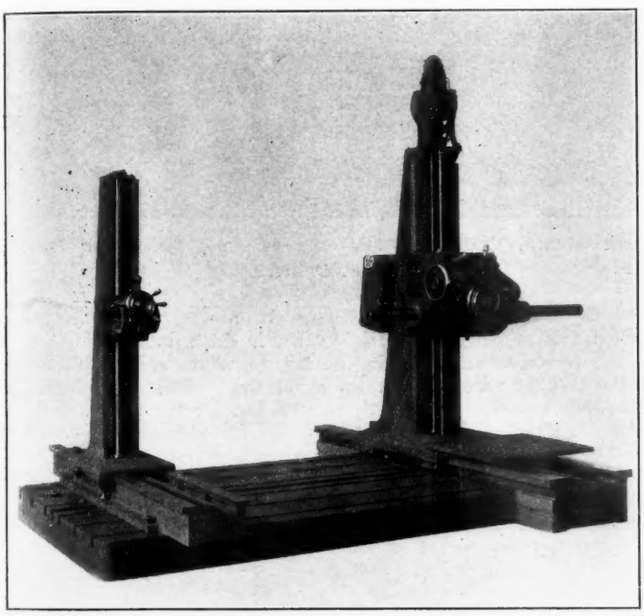
All driving and feed gears are either nickel steel, cast steel or manganese bronze. They are all enclosed in the saddle and are fully protected, running in oil. A wide range of speeds and feeds is provided, there being 10 speed and 8 feed changes, and 4 feed changes available for milling only. All of the feeds are reversible. Rapid power traverse is furnished for the spindle saddle and column in all directions, and hand adjustments are also provided. Graduated scales with vernier readings are provided for locating the saddle and main column. The outboard support and column are also furnished with scales, having vernier readings. The spindle has a micrometer reading for gaging depths in boring, drilling and milling, and these graduations are also convenient for laying out work.

The column is of heavy construction, with a long and wide base designed to give the utmost rigidity. The slide base is heavy and of deep section, and is firmly braced throughout its entire length with strong box ties. It is provided with a groove on the side for accurately locating the floor plate, which latter is planed top and bottom and provided with longitudinal T-slots, unless otherwise specified. The slide base is rigidly attached to the floor plate by heavy bolts; the latter may be made any desired size, the standard being 6 ft. x 9 ft.

The outboard bearing is provided with the same vertical and horizontal traverse as the main column and is adapted for sup-

porting boring bars in suitable bushings. It is traversed to and from the main column by a rack and pinion and is guided so as to remain parallel at all times with the main slide base. The head and column of the outboard support are traversed by hand wheels located concentrically. Graduated scales are furnished corresponding to the scales on the main column and base. The saddle, column, outboard support, etc., are guided by flat surface bearings, close together, and of ample length to insure rigidity.

The spindle is of crucible steel, and all of its bearings are bushed with best quality of phosphor bronze. A superior grade of steel is used for all shafts, studs, etc., practically no machine steel being used. The equipment as furnished includes the machine complete with motor, floor plate, outboard support and graduated scales; special tables, boring bars, cutters, etc., will be furnished extra, if desired. The machine may be varied to meet special conditions requiring different traverse of spindle, saddle or column, or size and style of floor plate. The range of spindle speeds may be changed from the standard speeds of 15-200 r.p.m. to 10-133 r.p.m. or 7½-100 r.p.m., etc. These



Horizontal Boring, Drilling, Tapping and Milling Machine.

machines are manufactured by the Rochester Boring Machine Company, Rochester, N. Y.

The specifications of standard No. 3, No. 4 and No. 5 machines are as follows:

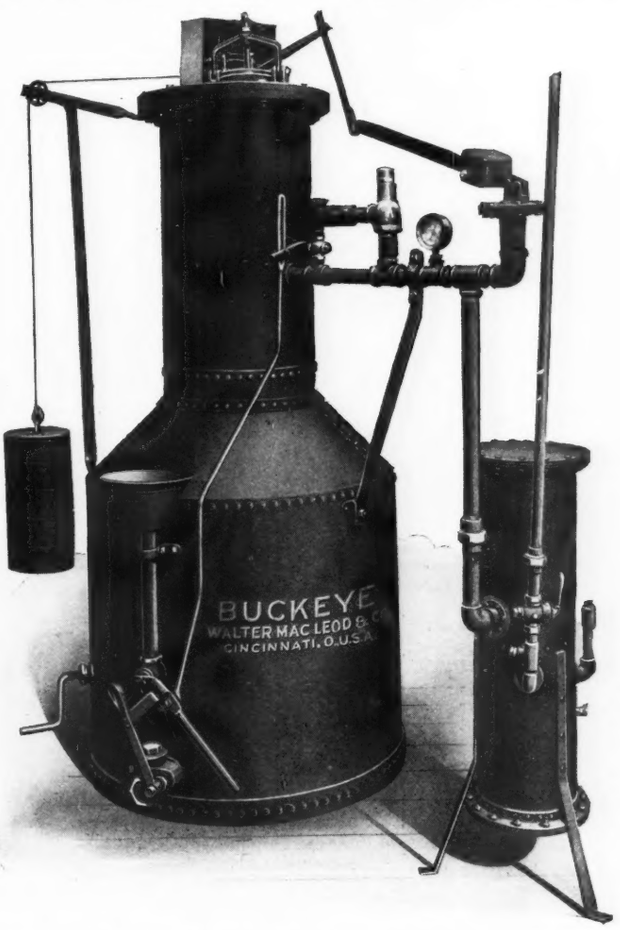
Number of machine	3.	4.	5.
Spindle diameter,	3⅜ in.	4½ in.	5½ in.
Spindle traverse, longitudinal	36 in.	48 in.	60 in.
Spindle speed, revs. per min.	15 to 200	6 to 120	2½ to 100
Number of speeds for spindle	10	12	16
Number of feeds for boring	8	10	12
Number of feeds for milling	4	5	6
Boring feeds per revolution spindle per minute, inches	0.01 to 0.25	0.01 to 0.5	⅜ to 5
Milling feeds per revolution spindle per minute, inches	0.04 to 0.152	0.04 to 0.304	⅜ to 5
Taper bore in spindle, one end, Morse	5	6	7
Saddle, vertical traverse	54 in.	60 in.	72 in.
Column, horizontal traverse	72 in.	84 in.	96 in.
Size of floor plate	6 x 9 ft.	7 x 10 ft.	8 x 12 ft.
Size of motor recommended	3-h.p.	5-h.p.	10 h.p.
Net weight complete	19,000 lbs.	29,500 lbs.	58,000 lbs.

Autogenous Welding in Railway Repair Shops.

Autogenous welding has proved especially valuable in railway locomotive boiler shops in the repairing of flue sheets, cracked and broken crown sheets, water legs, arches, etc., and its uses in the other departments are numerous. About two years ago one of the largest railways in the East repaired a broken crown sheet as a test, and the locomotive is said to have been in constant service ever since without any sign of deterioration in the weld. A number of other boilers have also been successfully repaired for this same road.

The Buckeye autogenous welding outfit, manufactured by Walter MacLeod & Company, Cincinnati, Ohio, is made in three stock sizes, and special equipments to meet all demands, both maximum and minimum, are built to specifications. The welding plant has three principal features, the oxygen supply, acetylene supply and the torch with its accessories. The oxygen generating plant of the Buckeye welding equipment is a simple device for the manufacture of gas. It consists of a retort in which a mixture of potassium or sodium chlorate and manganese dioxide is placed. The retort is installed in a small portable furnace, which latter is heated either by gas, gasolene, kerosene or coke. The retort is connected by means of an extra heavy pipe, with the necessary valves, gage and safety valve, to a wrought iron scrubber, in which the gas is cleaned, filtered and cooled, and from which it passes to a steel receiver arranged to be used as a portable tank or made stationary as a container.

The pressure acetylene generator, shown in the illustration, is of the carbide feed type. These generators are built to



Acetylene Generator of the Buckeye Autogenous Welding Outfit.

contain 25, 50, 100 or 200 lbs. of carbide in the hopper, generating 100, 200, 400 and 800 cu. ft. of gas, respectively. The generation of gas is automatic, and when the pressure is adjusted to any given point, it so remains until the charge is exhausted or the adjustment changed. A safety valve of ample size is connected directly to the receiver and storage chamber, and the pressure gage is placed in the pipe line ahead of the pressure regulator; this automatically keeps the pressure indication at a certain point, according to the position of the sliding weight on the pressure arm.

The torch is one of the important features of the equipment. It is light in weight, positive in its mixture of gas, has a flash-back protection and an ample number of tips to take care of all grades of welding. A cutting point accompanies each torch, and for extra heavy work a special cutting attachment is supplied.

The operation of generating oxygen with the Buckeye plant is as follows: About 12 to 15 lbs. of sodium or potassium

chlorate and manganese dioxide, in a mixture, is placed in a pan in the retort. Heat is applied and the valve to the scrubber opened when the generation of gas begins. The valve between the scrubber and the receiver is next opened, allowing the oxygen to flow into the receiver. When the generation of gas ceases, the valve is closed, the pan of exhausted chemical is removed from the retort, and a new one substituted for it. This operation is continued indefinitely, according to the amount of gas required.

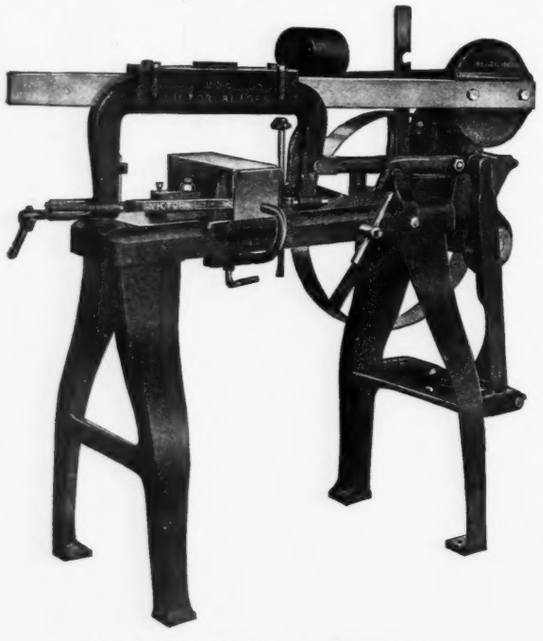
The generation of acetylene gas is also a simple process. The water and the flash back chambers are each filled with water and the carbide hopper with carbide. On opening the hopper, the water is automatically shut off, and it cannot be started until the hopper has been sealed, when the generation of gas commences.

In operating the torch the acetylene is first turned on and ignited and the valve is properly adjusted. The oxygen is then turned on and its valve is adjusted until a clear cut white flame, oval in shape, appears at the extreme end of the tip, and surrounding it a more voluminous, almost colorless, flame. The white, sharply defined flame is the welding one, and the surrounding jacket is a protection, as it guards the weld against oxidation from the outside air.

Power Hack Saw Machine.

The Massachusetts Saw Works, Chicopee, Mass., manufacturers of Victor hack saw blades, frames, machines, etc., has recently added to its line a new hack saw machine. It is illustrated herewith, and is known as the No. 6 M. S. W. hack saw machine. Each part is high grade in every particular, being built like a machine tool. It has a capacity for cutting 6-in. stock and is unusually rigid and strong, the frame being strongly braced, eliminating all side play and vibration and assuring a straight cut.

An adjustable stop is provided for making cuts of any desired depth. The machine stops automatically and does not require



M. S. W. Hack Saw Machine.

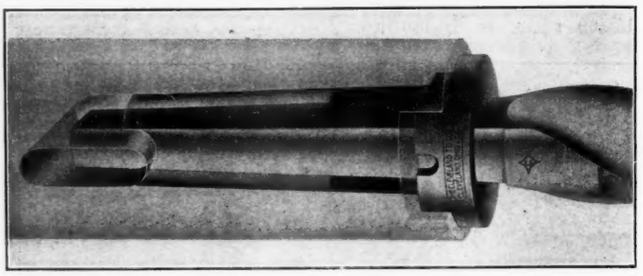
any attention after the cut is started. There is also a rest for the stock, which prevents the blades from getting broken when the piece falls, as often happens on the old-style machines.

This machine has a steady, even, forward stroke, similar to that of a man with a file, and a quick return stroke. There is a patent lift that may be adjusted to raise the blade from $^1/_{1000}$ to $\frac{1}{8}$ in. above the work on the return stroke, thus eliminating the wear on the teeth on the return and greatly increasing the life of the blade, a feature that very soon results in a saving of hack saw blades sufficient, it is claimed, to cover the cost of the machine.

New Drive for Flat Twist Drills.

The Cleveland Twist Drill Company, Cleveland, Ohio, has recently applied for patents on a new device for driving drills with flat shanks, that are tapered both on the flat sides and round edges. These shanks are regularly furnished on this company's "Paragon" flat twist drills, and are driven by sleeves or sockets having flat taper holes, accurately fitting the shanks of the drills, and externally tapered to fit standard taper sockets or spindles. In the case of large diameter flat twist drills having No. 6 shanks, this drive was found to have certain disadvantages as it made necessary the use of cumbersome extension reducing sockets to adapt the large shanks to the drill press spindles. To overcome this difficulty as well as to provide additional driving strength, the new drive, illustrated herewith, was designed.

Both the No. 5 and No. 6 "Paragon" shanks have been redesigned to the same length as regular taper shanks, the taper



Drill Shank, Collet and Spindle of New Drive for Flat Twist Drills.

on the round edges being the standard Morse, as heretofore. When this modified shank is inserted in the spindle, its upper end is received and driven by the flat slot in the spindle just as is the tang of an ordinary taper shank drill. This alone would constitute a strong and practical drive, but for the lack of support the shank would have on its two flat sides at the lower end of the spindle. To provide against the resultant possibilities of vibration and wear between the shank and spindle, and to furnish a powerful additional drive at the lower end of the shank, where its cross sectional area is greatest, a new and original type of socket, called the "Paragon" collet, has been devised.

The collet has two lugs projecting upward from a flattened disc through which is cut a rectangular hole to receive the shank. The lugs have rounded outside surfaces ground to standard taper and flat inner surfaces tapered to fit the flat taper shank. A groove is provided to receive the point of a drift key in case the collet should stick in the spindle. When the collet is on the shank the combination is practically a taper shank, interchangeable with the standard shank of that type and with an unusually long tang.

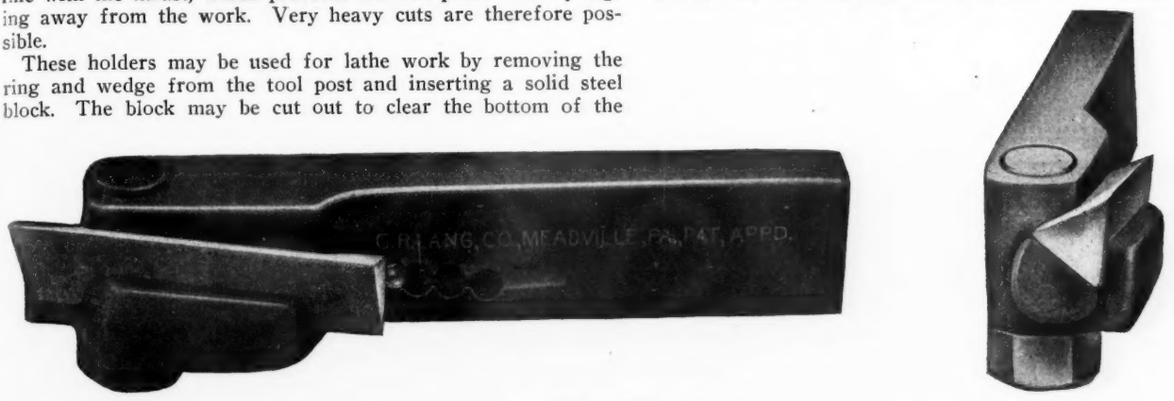
The illustration shows the shank, collet and spindle, in combination. The additional drive is provided by the extension which projects from the circular base of the collet. This projection mortises into a slot cut across the end of the spindle conforming to the standard slots now being put in the spindles of heavy duty drill presses by several well known manufacturers. That this tongue-and-groove drive at the large end of the shank is very much stronger than any drive on the tang could possibly be is evident from the illustration. The collets without this extension will fit any spindle or socket and will be furnished to those whose spindles are not fitted with slots, when this requirement is plainly specified, but they will, of course, not have the additional driving strength otherwise afforded.

Lang Tool Holder.

The G. R. Lang Company, Meadville, Pa., has designed a tool holder, illustrated herewith, to cover the range of work handled by the ordinary tool holder and to displace the solid tool on a large class of heavy work. Rolled, triangular-section, high-speed steel cutters are used of greater area and depth than if of square steel for the same class of work. The size of the point is said to provide ample radiating surface for heat, while the method of clamping the tool provides rigidity. Proper

top and side angles may be provided with this triangular steel without waste in grinding. The extension at the front of the holder supports the tool under the cutting point, and in a direct line with the thrust, which prevents the tool point from springing away from the work. Very heavy cuts are therefore possible.

These holders may be used for lathe work by removing the ring and wedge from the tool post and inserting a solid steel block. The block may be cut out to clear the bottom of the tool post when necessary. The holders are said to be especially advantageous for vertical boring mill work. Special designs are made for this purpose, having, however, the same general features as the holder shown.



Lang Tool Holder.

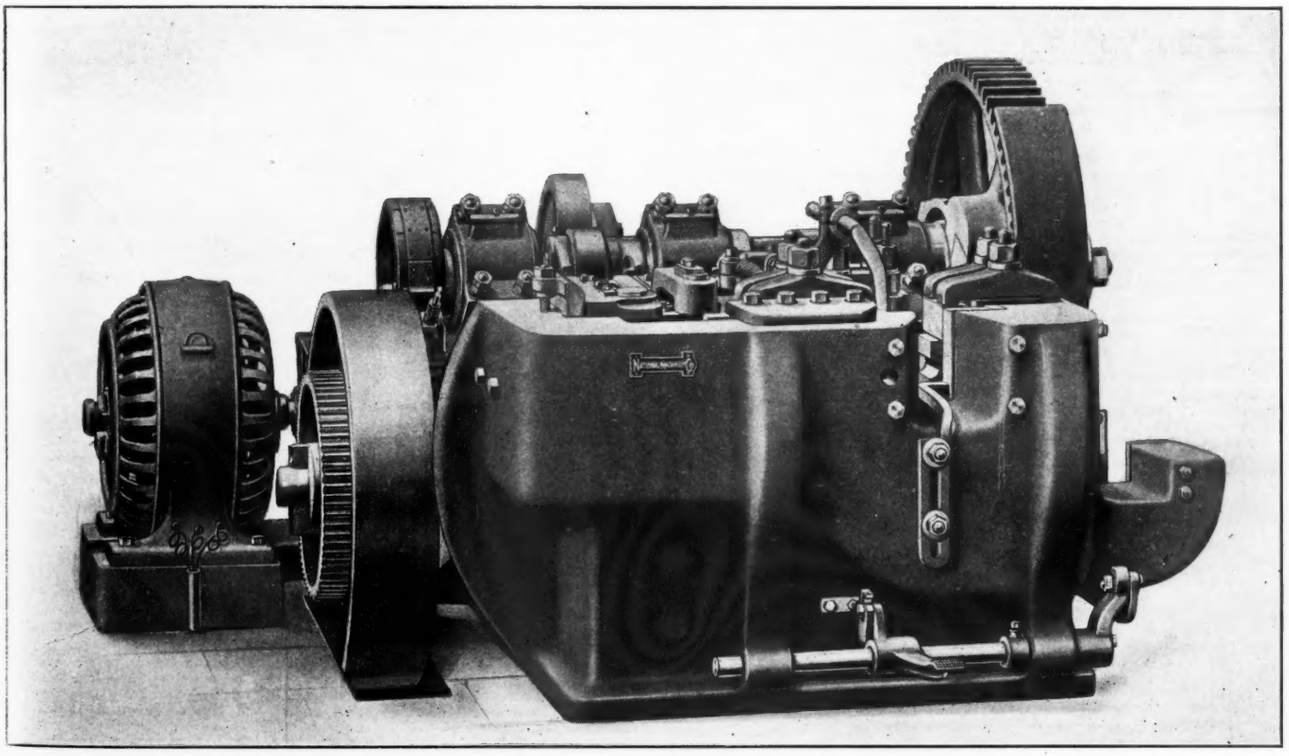
National Improved Forging Machine.

Among the many new and improved designs shown at the recent exposition, by the National Machinery Company, of modern bolt, nut and forging machinery, at Tiffin, Ohio, August 19 to 23, none attracted more attention or proved of greater interest than its line of improved forging machines. The new features that attracted the greatest attention were the friction slip fly wheel design and the direct motor drive construction.

The friction slip fly wheel design, for which a patent is pending, while extremely simple in details, meets a positive requirement in forging machine construction. It is a protection or relief to the machine against the enormous strains thrust upon it by the fly wheel momentum when the machine stalls, or, in other words, is prevented from completing the revolution due to an excess of stock or cold metal being fed into the dies. The fly wheel is held between friction flanges which are keyed to the shaft. When excessive material or cold stock is fed into the machine and prevents the heading tool from completing a full stroke, the fly wheel slips between these friction flanges. This action dissipates the momentum of the wheel and eliminates the strains attendant with a rigid fly wheel. It thus protects not only the machine, but the motor as well.

In the National direct motor drive design the motor is secured to a bracket attached to the machine bed. The motor pinion meshes with a gear bolted to the friction fly wheel. This design insures compactness, protection to the motor and the machine and has proven after exhaustive tests to be the most practical method of direct connecting a motor to a forging machine.

The double cam mechanism operating the grip is also an interesting feature. It permits the opening and closing of the dies to be timed so as to give an unusually large upset or gathering capacity, and makes possible a wider range of work and more intricate forgings in fewer operations. These machines are built in sizes of 1½, 2, 2½, 3, 3½ and 4-in. capacity. The illustration shows a machine of the 2-in. size, and displays both the friction slip fly wheel and the direct motor drive designs plainly.



Two-inch National Improved Forging Machine.

ANNUAL REPORTS

UNION PACIFIC RAILROAD COMPANY—THIRTEENTH ANNUAL REPORT.

INCOME FOR THE YEAR.

The gross revenues and expenses of the Union Pacific Railroad and auxiliary companies, after excluding all offsetting accounts between them, were as follows:

	1910.	1909.	+Increase. —Decrease.
Average miles of railway operated during the year	6,296.22	6,062.13	+ 234.09
TRANSPORTATION OPERATIONS.			
Gross operating revenues	$88,506,465.44	$77,360,429.36	+$11,146,036.08
Outside operations—revenues	1,721,626.76	1,390,032.19	+ 331,594.57
Total revenue	$90,228,092.20	$78,750,461.55	+$11,477,630.65
Operating expenses	$45,132,681.73	$36,503,075.95	+ $8,629,605.78
Outside operations—expenses	1,806,227.61	1,442,009.61	+ 364,218.00
Taxes (rail lines and property dealt with as outside operations)	3,264,347.51	2,570,561.89	+ 693,785.62
Total expenses and taxes	$50,203,256.85	$40,515,647.45	+ $9,687,609.40
Revenue over expenses and taxes	$40,024,835.35	$38,234,814.10	+ $1,790,021.25
Charges.			
Interest on funded debt in the hands of the public (table 15)	$12,455,577.15	$13,331,368.07	— $875,790.92
Sinking fund requirements	16,013.33	12,013.33	+ 4,000.00
Hire of equipment—balance	1,923,095.63	1,389,483.26	+ 533,612.37
Rentals for lease of road—balance	14,928.71	14,029.36	+ 899.35
Total	$14,409,614.82	$14,746,894.02	— $337,279.20
Deduction: Rentals from joint trks, yds. and term—bal. $330,547.55; Miscellaneous: Rentals—bal. 42,780.90; Income 5,090.06	378,418.51	374,087.75	+ 4,330.76
	$14,031,196.31	$14,372,806.27	— $341,609.96
Surplus frm transp. oper. after payment of charges	$25,993,639.04	$28,862,007.83	+ $2,131,631.21
Application of Surplus.			
Dividends on stocks of Union Pacific Railroad Co.: 4 per cent. on preferred stock	$3,981,760.00	$3,981,760.00	
6 per cent. on common stock	13,022,319.50	11,806,996.33	+ $1,215,323.17
Dividends on preferred stock of the Oregon Railroad & Navigation Co. in the hands of the public	240.00	64.00	+ 176.00
	$17,004,319.50	$15,788,820.33	+ $1,215,499.17
Surplus after payment of dividends	$8,989,319.54	$8,073,187.50	+ $916,132.04
INCOME OTHER THAN FROM TRANSPORTATION OPERATIONS.			
Interest on bonds owned of companies other than Oregon Short Line Railroad and Oregon Railroad & Navigation Cos. (table 16)	$1,263,983.16	$1,119,155.80	+ $144,827.36
Dividends on stocks owned of companies other than Oregon Short Line Railroad and Oregon Railroad & Navigation Cos. (table 17)	15,298,078.00	14,711,806.72	+ 586,271.28
Balance of interest on loans and on open accounts other than with auxiliary companies	2,559,720.18	1,556,659.64	+ 1,003,060.54
Rentals from steamships	304,800.00	304,800.00	
Net income from lease of unpledged lands and town lots	928.13	2,576.40	— 1,648.27
Miscellaneous receipts	87,318.40	59,761.52	+ 27,556.88
Total	$19,514,827.87	$17,754,760.08	+ $1,760,067.79
Less—Miscellaneous payments	2,776.52	18,366.65	— 15,590.18
Total income other than from transportation operations	$19,512,051.35	$17,736,393.43	+ $1,775,657.92
Deduction: Dividends on stocks of Union Pacific Railroad Co.: 4 per cent. on common stock	8,681,546.35	7,871,330.89	+ 810,215.46
Surplus income other than from transportation operations	$10,830,505.00	$9,865,062.54	+ $965,442.46
Total surplus from transportation operations and from other income after payment of dividends	$19,819,824.54	$17,938,250.04	+$1,881,574.50

The results of the year's operations, compared with those of the preceding year, were as follows:

	Increase.	Per cent.
Average miles of railway operated	234.09	3.86
Gross operating revenues and revenues from outside operations	$11,477,630.65	14.57
Operating expenses and expenses of outside operations	8,993,823.78	23.70
Taxes	693,785.62	26.99
Revenue over expenses and taxes	1,790,021.25	4.68
Income other than from transportation operations	1,775,657.92	10.01
Total income	3,565,679.17	6.37
Fixed charges	*341,609.96	2.38
Surplus over fixed charges	3,907,289.13	9.39

*Decrease.

ASSETS AND LIABILITIES.

The assets and liabilities of the Union Pacific Railroad and auxiliary companies are shown in detail in table No. 5. The securities owned are stated after eliminating all offsetting accounts between the companies, thus dealing only with the securities in the hands of the public, the assets collectible from the public and the liabilities payable to the public.

The increase or decrease in assets or liabilities since last report, briefly stated, is as follows:

Increase in assets:		
Cost of railways, equipment and appurtenances, as shown in detail under "Capital Expenditures"		$11,947,075.57
Demand loans to Southern Pacific Co.	$10,901,568.97	
Other demand loans and time deposits	8,650,000.00	
		19,551,568.97
Loans to Utah Light & Railway Co.		2,155,392.63
Expenditures for the construction of new lines and for terminal properties	$9,747,516.32	
Rolling stock	2,694,743.32	
Ocean steamships	1,013,167.38	
		13,455,427.02
Due from proprietary companies		343,558.40
Material, fuel and supplies		1,547,665.72
Current cash accounts		1,731,230.24
Total		$50,731,918.55
Deduction:		
Decrease in cash on hand	$17,908,362.35	
Loans to San Pedro, Los Angeles & Salt Lake R. R. Co.	3,099,371.69	
Stocks and bonds of other companies disposed of or acquired, as shown in tables 9, 10 and 11, viz.:		
Stocks and bonds sold	$24,858,104.60	
Stocks transferred to other accounts	348,750.00	
Total	$25,206,854.60	
Less:		
Stocks acquired under subscription rights and stocks purchased	$15,801,981.69	
Stocks taken over in settlement of accounts	834,500.00	
Bonds purchased and bonds taken over in settlement of accounts	7,156,997.50	
Total	$23,793,479.19	
		$1,413,375.41
Adjustments in contingent unadjusted accounts		818,740.52
		23,239,849.97
Net increase in assets		$27,492,068.58
Decrease in liabilities: Funded debt	$25,336,650.00	
Deduction:		
Increase in common stock	$17,275,400.00	
Due to proprietary companies	600,756.48	
Current cash accounts	1,975,373.36	
Reserve for depreciation of steamships and equipment	188,330.56	
	20,039,860.40	
		5,296,789.60
Increase in assets in excess of increase in liabilities (gain in profit and loss)		$32,788,858.18

With the exception of 7,249 shares (par value $100 each) of Northern Securities Company "Stubs," the company has sold all the stock of the Northern Securities Company, the Great Northern Railway Company and the Northern Pacific Railway Company, received in the distribution of the assets of the Northern Securities Company and the stocks subsequently acquired by subscription rights.

The statement at the top of the following page shows the transactions growing out of the original investment in the 824,918.71 shares of the capital stock of the Northern Securities Company and the reinvestment of the proceeds received from the sale of the respective stocks.

In table No. 5 the proceeds from the sales of the above stocks are treated as a credit against the cost of stocks and bonds.

The stocks and bonds owned, other than stocks and bonds of the Union Pacific Railroad and auxiliary companies, stand charged at the close of the year with $208,561,011.65. This charge includes not merely the above stocks and bonds, but also the other stocks and bonds, shown in detail in tables Nos. 9, 10 and 11.

The details of the stocks and bonds of the Union Pacific Railroad and auxiliary companies issued and outstanding are shown in tables Nos. 7 and 8. From table No. 8 it will be seen that the companies own bonds, unpledged, to the amount of $79,767,500.00 face value.

Company.	Stocks acquired. Shares.	Cost.	Stocks sold. Shares.	Amount realized.	Stocks on hand, unsold. June 30, 1910. Shares.	Cost.	Ave. cost Per share.
Northern Securities Co. (a)	824,918.71	$79,459,691.36	100,000.18	$16,880,019.46	.....	.....	....
Great Northern Ry. preferred	73,589.69	7,358,960.00	290,709.89	65,541,736.66	.....	.....	....
Great Northern Ry. sub. receipts	2,600	281,837.50	2,000.60	255,940.98	.....	.....	....
Great Northern iron ore properties	90,364	(b)	90,364	6,658,676.98	.....	.....	....
Northern Pacific Ry.	.....	(a)	282,828.82	54,986,401.91	.....	.....	....
Northern Pacific Ry. sub. receipts (50, 62½ and 75% paid)	34,516	2,290,912.50	34,516	3,054,509.50	.....	.....	....
Northern Securities Co. "Stubs"	.....	.....	.1871	56.13	7,249	(a)	....
Total Northern Securities investment	.....	$89,391,401.36	.....	$147,377,341.62	.....	.....	....
Reinvestments.							
Atchison, Topeka & Santa Fe preferred	100,000	$10,395,000.00	100,000	$10,491,703.14	.....	.....	....
Baltimore & Ohio preferred	72,064	6,665,920.00	.....	.....	72,064	$6,665,920.00	92.50
Baltimore & Ohio common	323,342	38,801,040.00	.....	.....	323,342	38,801,040.00	120.00
Chicago, Milwaukee & St. Paul preferred	18,450	1,845,000.00	.....	.....	18,450	1,845,000.00	100.00
Chicago, Milwaukee & St. Paul common	72,800	9,765,187.74	72,800	9,982,186.63	.....	.....	....
Chicago & Northwestern Ry. common	40,187.50	6,750,423.94	.....	.....	40,187.50	6,750,423.94	167.97
Chicago & Alton R. R. preferred	103,431	8,946,781.50	.....	.....	103,431	8,946,781.50	86.50
Illinois Central R. R.	231,415.65	37,692,256.21	6,415.65	948,805.73	225,000	36,743,450.48	163.30
New York Central & H. R. R. R.	178,571	23,205,679.93	.....	.....	178,571	23,205,679.93	129.95
Railroad Securities preferred	19,359	1,956,184.26	.....	.....	19,359	1,956,184.26	101.05
Railroad Securities common	34,834	4,980,512.10	.....	.....	34,834	4,980,512.10	140.39
Total reinvestments	.....	$151,003,985.68	.....	$21,422,695.50	.....	$129,894,992.21	....
Total	.....	$240,395,387.04	.....	$168,800,037.12	.....	$129,894,992.21	....

(a) For 724,918.71 shares of Northern Securities Co. stock, there were received in exchange 216,520.8949 shares of Great Northern Ry. Co. stock, 281,828.8215 shares of Northern Pacific Ry. Co. stock and 7,249.1871 shares of Northern Securities Co. stubs.
(b) Included in the $79,459,691.36 original cost of Northern Securities Co. stock.

CAPITAL EXPENDITURES.

The charges to capital account, other than for stocks and bonds in companies other than the Union Pacific Railroad and auxiliary companies, were as follows:

Expenditures for account of the construction of railways taken over into cost of railways, equipment and appurtenances			$149,289.60
Expenditures for account of extensions and cost of extensions transferred from deferred assets, viz.:			
Union Pacific Railroad Company:			
Cloverly to Hungerford, Colorado	$264,477.01		
Dent to Fort Collins, Colorado	501,210.53		
Grant Mine to La Salle, Colorado	442,515.78		
Greeley to Briggsdale, Colorado	313,474.97		
Onaga to Marysville, Kansas	509,016.56		
O'Fallons to Northport, Nebraska	287,479.51		
Pine Bluffs Branch, Wyoming	27.98		
Rock Springs to Coal Fields, Wyoming	7,236.60		
Sand Creek to St. Vrains, Colorado	484,917.09		
Summit to Lane, Nebraska	24,478.56		
		$2,834,834.59	
Oregon Short Line Railroad Company:			
Kemmerer to North Kemmerer, Wyoming		45.33	
Oregon Railroad & Navigation Company, Coyote to Echo, Ore.	$6,918.84		
St. John's to Troutdale, Oregon	265,409.55		
	$272,328.39		
Less credit:			
Elgin to Joseph, Oregon	17,121.73		
		255,206.66	
			3,090,086.58
Expenditures for additions and betterments (Table No. 24), viz.:			
Roadway, track and appurtenances:			
Ballast	$138,722.32		
Bridges, trestles, culverts and grade crossings	346,213.81		
Changes in line, revision of grades, widening embankments and tunnel improvements	660,244.94		
Increased weight of rails, improved frogs and switches, track fastenings and appurtenances	425,251.33		
Interlocking, block and highway crossing signals	399,013.78		
Main tracks	4,985,227.97		
Real estate, right-of-way and station grounds and fencing right-of-way	1,176,017.29		
Sidings and passing tracks	777,732.51		
Telegraph and telephone lines	92,556.42		
		$9,000,980.37	
Buildings, structures and appurtenances:			
Engine houses, shops, machinery, tools, etc.	$400,873.27		
Roadway buildings, machinery, tools, etc.	173,284.26		
Station buildings, terminal yards and appurtenances	463,371.75		
Water and fuel stations	311,566.30		
		1,349,095.58	
Equipment:			
Additions and improvements to existing equipment	$43,675.97		
23 locomotives	302,482.64		
61 passenger-train cars	380,926.96		
1,758 freight-train cars	1,710,027.32		
756 work equipment	161,506.79		
	$2,598,619.68		
Less:			
12 locomotives, 20 passenger-train cars, 2,080 freight-train cars and 256 work equipment, vacated during the year	1,538,650.82		
		1,059,968.86	
			11,410,044.81
Improvements to Northern Pacific Terminal property, Portland, Ore.			25,777.62
Adjustment in amount, deducted from cost of railways, equipment and appurtenances on account of the difference between the face value of stocks and bonds of the auxiliary companies and the prices at which they were taken over.			98,259.38
Total charges			$14,773,457.99
Credits:			
Amount received from the trustee of the Union Pacific Railroad Company's first railroad and land grant mortgage, in payment for expenditures for betterments, improvements, equipment, etc., not otherwise provided for		$2,050,000.00	
Abandoned property not to be replaced (rail lines)		442,813.80	
Floating equipment sold		233,163.62	
Real estate sold		100,405.00	
			2,826,382.42
Net expenditures for capital account			$11,947,075.57

The accounting regulations of the Interstate Commerce Commission in respect to charges for "Additions and Betterments," effective July 1, 1909, require that the original cost (estimated if not known) of equipment retired be credited, and the cost of equipment acquired be charged directly to the equipment accounts. The changes during the year in the equipment, dealt with in accordance with these regulations, were as follows:

Condemned, Destroyed, Sold or Transferred to Another Class and Credited to Equipment	No.	Added and charged to—Equipment. No.	Union Pacific Equipment Association. No.	Total. No.	Total. Cost.
Locomotives	(a) 12	(e) 23	(i) 35	58	$949,105.02
Baggage cars	.....	21	26	47	
Baggage, mail and passenger cars	.....	1	.....	1	
Baggage and mail cars	.....	2	8	10	
Baggage and passenger cars	2	3	.....	3	
Business cars	1	.....	.....	.....	
Chair cars	.....	10	.....	10	
Composite cars	6	.....	.....	.....	
Dining cars	1	8	2	10	
Motor cars	.....	.....	6	6	
Observation cars	.....	.....	4	4	
Passenger cars	7	5	27	32	
Postal cars	3	11	.....	11	
Total passenger-train cars	(b) 20	(f) 61	(j) 73	134	$1,093,005.13
Box cars	1,131	746	396	1,142	
Caboose cars	13	25	*26	*1	
Flat cars	57	50	*50	.....	
Furniture cars	272	250	.....	250	
Gondola cars	317	2	.....	2	

*Credit.

Condemned, Destroyed, Sold or Transferred to Another Class and Credited to Equipment	No.	Added and charged to—Equipment. No.	Union Pacific Equipment Association. No.	Total. No.	Cost.
Gondola (D. B.) cars	2	449	*299	150	
Gondola (H. B.) cars	4	.....	.....	.....	
Refrigerator cars..	36	.....	.....	.....	
Stock cars.....	242	210	*100	110	
Tank (oil) cars...	.....	25	*25	.....	
Narrow gauge cars	6	.....	.....	.....	
Total freight-train cars...	(c)2,080	(g)1,757	(k)*104	1,653	$1,582,309.63
Work equipment..	(d)256	(h)756	(l)458	1,214	$734,592.50
Total	.....	.....	.....	.....	$4,359,012.28

*Credit.

(a) The original cost of these twelve locomotives was $107,855.01.
(b) The original cost of these twenty passenger-train cars was $172,252.47.
(c) The original cost of these 2,080 freight cars was $1,144,276.39.
(d) The original cost of this work equipment was $114,266.95. The total cost of all the equipment condemned, destroyed or transferred to another class and credited to equipment was $1,538,650.82.
(e) The twenty-three locomotives added and charged to equipment cost $302,482.64.
(f) The sixty-one passenger-train cars cost $380,926.96.
(g) The 1,757 freight-train cars cost $1,710,027.32.
(h) The work equipment cost $161,506.79. The total equipment cost $2,554,948.71.
(i) The thirty-five locomotives added to Union Pacific Equipment Association cost $646,622.38.
(j) The seventy-three passenger-train cars cost $712,078.17.
(k) The net credit of 104 freight-train cars amounted to $127,717.69.
(l) The work equipment cost $573,085.71. The total cost was $1,804,068.57.

The original cost, salvage value and amount charged to the operating expenses of the equipment retired during the year were as follows:

	Locomotives.	Passenger-train cars.	Freight-train cars.	Work equipment.	Total.
Original cost (estimated if not known)..	$107,855.01	$172,252.47	$1,144,276.39	$114,266.95	$1,538,650.82
Proceeds from sale or salvage value..	36,488.39	92,838.07	369,951.93	32,210.05	531,488.44
Charged to operating expenses ..	$71,366.62	$79,414.40	$774,324.46	$82,056.90	$1,007,162.38

The locomotives added during the year averaged 120.74 tons total weight of engine, without tender, and 87.24 tons upon drivers, and freight-train cars, 46.27 tons capacity.

The number of locomotives and cars of standard gauge owned and the total and the average capacity of freight-train cars at the close of the year were as follows:

	This year.	Last year.	Increase or Decrease.	Per cent.
Locomotives	1,133	1,087	46	4.23
Total weight, excluding tender (tons).....	95,596	89,808	5,788	6.44
Average total weight, excluding tender (tons)	87.82	82.54	5.28	6.40
Total weight on drivers (tons).....	78,841	74,182	4,659	6.28
Average total weight on drivers (tons)....	69.52	68.18	1.34	1.96
Passenger-train cars	824	710	114	16.05
Freight-train cars	26,043	26,464	*421	1.59
Total capacity (tons).....	1,014,311	984,923	29,388	2.98
Average capacity (tons).....	39.59	37.22	2.37	6.36
Work equipment	4,686	3,728	958	25.70

*Decrease.

TRANSPORTATION OPERATIONS.

The results of the year's transportation operations, compared with those of the preceding year, are as follows:

	This year.	Last year.	Increase or decrease.	Per cent.
Average miles of railway operated	6,296.22	6,062.13	234.09	3.86
Revenues:				
Passengers, including excess baggage	$20,814,819.96	$17,672,357.06	$3,142,462.90	17.78
Mail and express.....	4,509,434.37	4,354,717.19	154,717.18	3.55
Freight	61,479,679.70	54,000,195.46	7,479,484.24	13.85
Switching, rentals and all other sources	1,702,531.41	1,333,159.65	369,371.76	27.71
Total revenues.....	$88,506,465.44	$77,360,429.36	$11,146,036.08	14.41
Outside operations—revenue	1,721,626.76	1,390,032.19	331,594.57	23.86
Total revenues.....	$90,228,092.20	$78,750,461.55	$11,477,630.65	14.57
Operating expenses:				
Maintenance of way and structures	$9,915,481.65	$7,682,146.16	$2,233,335.49	29.07
Maintenance of equipment.	9,061,519.48	7,434,599.27	1,626,920.21	21.88
Traffic expenses	1,985,017.61	1,563,030.85	421,986.76	27.00
Transportation expenses...	22,205,806.68	17,914,908.92	4,290,897.76	23.95
General expenses	1,964,856.31	1,908,390.75	56,465.56	2.96
Total rail lines.....	$45,132,681.73	$36,503,075.95	$8,629,605.78	23.64
Outside operations—expenses	1,806,227.61	1,442,009.61	364,218.00	25.26
Total expenses	$46,938,909.34	$37,945,085.56	$8,993,823.78	23.70
Gross revenues over total expenses	$43,289,182.86	$40,805,375.99	$2,483,806.87	6.09

	This year.	Last year.	Increase or decrease.	Per cent.
Passenger traffic:				
Revenue passengers carried	$8,306,930	$7,190,853	$1,116,077	15.52
Revenue passengers carried one mile.....	960,734,984	795,199,750	165,535,234	20.82
Revenue from passenger trains per mile of road...	$4,022.14	$3,633.55	$388,59	10.69
Revenue from passenger trains per *revenue train* mile (a)	$1,63	$1.77	*$0.14	7.91
Average revenue per passenger per mile	2.122 cents	2.169 cents	*.047 cents	2.17
Average distance carried...	115.65 miles	110.58 miles	5.07 miles	4.58
Freight traffic: (Way-bill tonnage.)				
Tons of revenue freight carried	15,312,211	13,726,025	1,586,186	11.56
Tons of revenue freight carried one mile.....	5,997,233,894	5,266,658,054	730,575,840	13.87
Revenue per mile of road.	$9,764.54	$8,907.79	$856.75	9.62
Revenue per *revenue train* mile (b)	$4.62	$4.63	*$0.01	.22
Average receipts per ton per mile—revenue freight	1.024 cents	1.025 cents	*.001 cents	.10
Average distance carried—all freight	345.78 miles	343.33 miles	2.45 miles	.71

*Decrease. (a) Revenue passenger train and *all* mixed train miles. (b) Revenue freight train and *all* mixed train miles.

Compared with the preceding year, the per cent. of operating expenses (including expenses of outside operations) to the gross revenues (including revenues from outside operations) was as follows:

	Rail lines only.	Rail lines and outside operations.
For "Maintenance" (*Maintenance of Way and Structures, and Maintenance of Equipment*).....	21.44	....
For "Operations" (*Traffic Expenses, Transportation Expenses and General Expenses*).....	29.55	....
Total this year.....	50.99	52.02
Total last year.....	47.19	48.18

The operating revenues and operating expenses for the year distributed among the respective primary accounts provided for in the classification of the Interstate Commerce Commission are shown in table No. 26. The details of passenger and freight traffic are shown in tables Nos. 27 and 28.

The expenses of the rail lines for "Maintenance" increased $3,860,255.70, or 25.53 per cent., and for "Operation" $4,769,350.08, or 21.37 per cent., over last year. These increases have resulted principally from the higher wage schedules, a greater amount of renewals than were made last year, and from an increase in mileage of locomotives and cars in revenue service, caused partly by the movement of additional traffic, by additional trains run and higher speed of the trains.

There are in service twenty-three gasoline motor cars. The mileage of these cars, which aggregated 552,485 miles, is included in the mileage statistics.

In the following statements the operating expenses, although distributed as provided for in the classification of the Interstate Commerce Commission, have been combined under comprehensive titles of accounts so as to present the year's expenses in a concise form.

MAINTENANCE OF WAY AND STRUCTURES.

	This year.	Last year.	Increase or decrease.	Per cent.
Average miles operated—first and additional main tracks	6,800.46	6,477.27	323.19 +	4.99
Ballast	$83,295.97	$31,404.41	$51,891.56 +	165.24
Ties	1,825,730.78	1,663,355.05	162,375.73 +	9.76
Rails	280,674.92	346,554.65	*$65,879.73 —	19.01
Frogs, switches and other track material	844,805.60	837,113.24	7,692.36 +	.92
Total material for roadway and track	$3,034,507.27	$2,878,427.35	$156,079.92 +	5.42
Repairs of roadway and track	4,236,874.39	2,969,813.62	1,267,060.77 +	42.66
Bridges, trestles and culverts	448,674.58	392,453.76	56,220.82 +	14.33
Buildings, grounds and appurtenances	1,243,315.24	843,343.30	399.971.94 +	47.43
Snow and sand fences and snow sheds.....	16,345.65	12,440.72	3,904.93 +	31.39
Electric power, telegraph and telephone lines...	97,348.51	65,155.04	32,193.47 +	49.41
Superintendence	583,232.41	475,021.88	108,210.53 +	22.78
Stationery and printing..	29,223.37	19,507.53	9,715.84 +	49.81
Other expenses	35,169.23	25,982.96	9,186.27 +	35.35
Abandoned property	190,791.00	.....	190,791.00 +	100.00
Total	$9,915,481.65	$7,682,146.16	$2,233,335.49 +	29.07
Cost per mile—all main tracks	$1,458.06	$1,185.26	$272.80 +	23.02

*Decrease.

The increase in these expenditures resulted principally from the expenses incident to maintaining 323 miles of additional main tracks and 78 miles of sidings, the renewal of a much greater number of ties, the higher wage schedules and from charges under the rules of the Interstate Commerce Commission for property abandoned, formerly charged to Profit and Loss. Although the charge for the increase in weight of rails to Additions and Betterments has resulted in a diminution in the charge for rails put into the track, the cost of the labor in making these renewals, which exceeded by 18.86 miles the rails put in the track last year, is included in the above expenses.

The following rails, ties, tie plates and continuous rail joints were used in making renewals, and the entire cost thereof was charged to operating expenses, with the exception of $425,251.33 for increased weight of rails and improved frogs and switches, charged to additions and betterments, in accordance with the classification of Expenditures for Additions and Betterments promulgated by the Interstate Commerce Commission.

	This year.	Last year.	+Increase. —Decrease.
Miles of new steel rails	268.90	250.04	+ 18.86
Per cent. of renewal of all rail in track, including sidings	3.09	2.96	+ .13
Number of burnettized ties	1,453,287	1,345,221	+108,066
Number of other ties	741,219	627,279	+113,940
Total number of ties	2,194,506	1,972,500	+222,006
Equal to miles of continuous track	954.13	703.71	+ 250.42
Per cent. of renewal of all ties in track, including sidings	9.01	8.33	+ .68
Number of tie plates	2,251,758	2,674,101	—422,343
Equal to miles of continuous track	402.10	477.17	— 75.07
Number of continuous rail joints	153,089	163,578	— 10,489
Equal to miles of continuous track	217.46	232.35	— 14.89

The weight of rails per yard in main lines and branches at the close of the year was as follows:

MILES OF FIRST AND ADDITIONAL MAIN TRACKS OPERATED, EXCLUDING MILEAGE OPERATED UNDER TRACKAGE RIGHTS.

	Main line.	Branches.	Total.	Per cent. of total miles of track.	Per cent. last year.
Less than 56 lbs.	.16	224.90	225.06	3.33	4.07
56 lbs.	.14	577.00	577.14	8.54	8.63
60 lbs.	3.21	1,108.23	1,111.44	16.44	17.35
62 lbs.	.....	22.56	22.56	.32	.....
67 lbs.	.58	29.45	30.03	.44	.46
70 lbs.	744.12	481.57	1,225.69	18.14	19.26
75 lbs.	605.06	190.07	795.13	11.76	11.37
80 lbs.	1,532.08	23.55	1,555.63	23.02	24.70
85 lbs.	32.29	1.42	33.71	.50	.57
90 lbs.	1,163.65	18.92	1,182.57	17.50	13.59
Total	4,081.29	2,677.67	6,758.96	100.00	100.00

At the timber-treating plants of the companies, 2,121,316 cross-ties, 53,338 switch-ties and 2,000,000 tie plugs were burnettized, and 64,008 cubic feet of piling and other timber were creosoted.

TRANSPORTATION EXPENSES.

	This year.	Last year.	Increase.	Per cent.
Locomotives, fuel for	$7,084,790.58	$5,440,119.54	$1,644,671.04	+30.23
Locomotive service, other than fuel	4,805,010.50	3,763,862.88	1,041,147.62	+27.66
Train service	3,647,784.51	2,910,282.64	737,501.87	+25.34
Station and terminal service	4,397,029.15	3,733,702.98	663,326.17	+17.77
Injuries, loss, damage and other casualties	1,174,849.28	1,119,721.37	55,127.91	+ 4.92
Superintendence	880,857.76	779,737.26	101,120.50	+12.97
Stationery and printing	186,185.93	151,379.86	34,806.07	+22.99
Other expenses	29,298.97	16,102.39	13,196.58	+81.95
Total	$22,205,806.68	$17,914,908.92	$4,290,897.76	+23.95

The work done by the transportation department of the rail lines over that of last year is shown in the following table:

	Increase.	Per Cent.
Gross operating revenues	$11,146,036.08	+14.41
Transportation expenses	4,290,897.76	+23.95
Revenue passengers carried one mile	165,535,234	+20.82
Mileage of passenger cars	14,743,508	+18.33
Locomotive mileage with passenger trains, including helping	3,259,311	+24.80
Tons of revenue freight carried one mile	730,575,840	+13.87
Tons of revenue and company freight carried one mile	883,695,869	+13.82
Mileage of freight cars	40,864,564	+10.21
Locomotive mileage with freight and mixed trains, including helping	1,865,690	+14.30
Total locomotive mileage in service for which the attendant expenses are charged to "Transportation Expenses"	6,159,746	+21.32

The average number of tons of freight per train, and loaded cars per train (excluding caboose), and the tons per loaded car for the respective companies for the year were, as shown in the following table:

Revenue and Company Freight (Way-Bill Tonnage).	*Tons per Train.	+Increase. —Decrease.		Loaded Cars per Train.	+Increase. —Decrease.		Per Cent. of Loaded Car Mileage	Tons per Loaded Car.	+Increase. —Decrease.	
	Tons.	Tons.	Per Cent.	Cars.	Cars.	Per Cent.	To Total Car Mileage.	Tons.	Tons.	Per Cent.
Union Pacific R. R. Co.	543.45	— 8.16	1.48	26.07	—.98	3.62	75.99+1.28	20.85	+.46	2.26
Oregon Short Line R. R. Co.	589.91	+20.30	3.56	22.73	+.70	3.18	73.84+1.35	25.95	+.10	.39
Oregon Railroad and Navigation Co.	501.03	+ 4.90	.99	21.13	+.05	.24	83.06— .70	23.71	+.18	.76
Average all lines	547.89	— .60	.11	24.66	—.48	1.91	76.30+1.16	22.22	+.41	1.88

*Ton miles per revenue freight train and all mixed train miles.

The cost per locomotive mile run in revenue service and in non-revenue service for which the expenses are charged to "Transportation Expenses" was:

	This Year.	Last. Year.	
For fuel for locomotives	20.210 cents.	18.827 cents.	+1.383 cents.
For all transportation expenses.	63.345 cents.	62.000 cents.	+1.345 cents.

General Expenses.

	This Year.	Last Year.	Increase.	Per Cent.
Salaries and expenses of general officers	$194,902.42	$240,833.56	*$45,931.14	—19.07
Salaries and expenses of clerks and attendants	900,050.95	809,910.42	90,140.53	+11.13
Law expenses	271,923.65	261,779.50	10,144.15	+ 3.88
General office expenses	105,002.82	91,415.47	13,587.35	+14.86
Stationery and printing	118,323.61	156,192.74	*37,869.13	—24.25
Insurance	160,169.18	145,083.21	15,085.97	+10.40
Pensions	50,527.41	38,235.63	12,291.78	+32.15
Other expenses	163,956.27	164,940.22	*983.95	— .60
Total	$1,964,856.31	$1,908,390.75	$56,465.56	+ 2.96

*Decrease.

NO. 4.—PROFIT AND LOSS FOR THE YEAR ENDED JUNE 30, 1910.

Reserve for depreciation of equipment owned and leased to other companies		$117,006.70
Abandoned property not to be replaced		382,604.91
Cost of surveys written off		162,918.88
Advances to Portland & Asiatic Steamship Co.		672,276.30
Miscellaneous payments		3,626.64
Adjustments in accounts		25,391.80
Balance June 30, 1910, viz.:		
Income account	$114,788,209.04	
Sinking funds	1,008,437.83	
		115,796,646.87
		$117,160,472.10
Balance June 30, 1909		$85,007,788.69
Balance income from transportation operations (No. 2)	$8,989,319.54	
Balance income other than from transportation operations (No. 3)	10,830,505.00	
		19,819,824.54
Difference between $30,231,950 face value Union Pacific R. R. Co. Twenty Year Four Per Cent. Convertible Bonds retired and canceled and $17,275,400 par value common stock issued in exchange therefor		12,956,550.00
Profit on sales of securities other than investment stocks		1,338,714.56
Sinking fund contributions and income from sinking fund investments		34,841.96
Collections of old accounts	$13,099.95	
Less: Payments of old accounts	11,704.23	
		1,395.72
Proceeds from sale of unpledged lands and town lots		1,356.63
		$117,160,472.10

UNION PACIFIC RAILROAD AND AUXILIARY COMPANIES.

No. 9—Stocks Owned of Other Companies, June 30, 1910.

Company.	Total-Issued and Outstanding June 30, 1910.	Total Owned by Union Pacific Railroad and Auxiliary Companies.	+ Increase. — Decrease.
Camas Prairie Railroad	$20,000.00	$10,000.00	+ $10,000.00
Central Idaho Railroad	22,000.00	22,000.00	+ 22,000.00
Gray's Harbor & Puget Sound Railway	.....	.....	— 10,000.00
Green River Waterworks	225,000.00	225,000.00	.....
Ilwaco Railroad	315,000.00	315,000.00	.....
Kansas City Terminal Railway	1,000,000.00	100,000.00	.....
Leavenworth & Topeka Railway	50,000.00	25,000.00	.....
Leavenworth Depot & Railroad	150,000.00	50,000.00	.....
Occidental & Oriental Steamship (a)	.....	.....	— 8,750,000.00
Ogden Union Railway & Depot	300,000.00	150,000.00	.....
Oregon & Washington Railroad	1,000,000.00	999,300.00	.....
Pacific Express	.....	.....	— 2,400,000.00
Pacific Fruit Express	10,800,000.00	5,400,000.00	.....
Rattlesnake Creek Water	78,300.00	78,300.00	.....
Riverside Homestead	100,000.00	100,000.00	+ 100,000.00
St. Joseph & Grand Island Railroad:			
Common	4,600,000.00	3,080,500.00	+ 180,500.00
First preferred	5,500,000.00	1,415,100.00	+ 482,900.00
Second preferred	3,500,000.00	1,815,000.00	+ 565,000.00
Salt Lake & Idaho Railroad	16,000.00	16,000.00	+ 16,000.00
San Francisco & Portland Steamship	500,000.00	500,000.00	+ 500,000.00
San Pedro, Los Angeles & Salt Lake Railroad	25,000,000.00	12,500,000.00	.....
Short Line Land & Improvement	100,000.00	50,000.00	.....
Topeka Iron	110,000.00	55,000.00	.....
Union Depot & Railway (Denver)	400,000.00	240,000.00	.....
Union Depot (Kansas City)	500,000.00	45,000.00	.....
Union Land	10,000.00	45,000.00	.....
Union Pacific Coal	5,000,000.00	5,000,000.00	.....
Union Pacific Equipment Association	100,000.00	100,000.00	.....
Union Pacific Land	100,000.00	100,000.00	.....
Union Pacific Water	500.00	500.00	.....
Utah Light & Railway:			
Common	2,052,250.00	1,849,525.00	+ 75.00
Preferred	3,996,500.00	3,840,875.00	+ 3,000.00
Total, 1910	.....	$38,092,100.00	— $9,280,525.00
Total, 1909	.....	$47,372,625.00	.....

(a) This company has been liquidated and the investment of $310,198.95 has been transferred to Contingent Assets pending final adjustment.

Note—Of the total $100,000.00 Union Pacific land stock $99,400.00 was pledged and the remaining $600 was unpledged.

UNION PACIFIC RAILROAD AND AUXILIARY COMPANIES.

No. 6.—Receipts and Expenditures from all Sources, Year Ended June 30, 1910.

EXPENDITURES.

Capital Liabilities.		
U. P. R. R. Co., Twenty Year Four Per Cent. Convertible bonds retired and canceled	$30,231,950.00	
O. S. L. R. R. Co. Income "A" Bonds acquired	8,500.00	
	$30,240,450.00	
Deduct for:		
U. P. R. R. Co. First Lien and Refunding Four Per Cent. Bonds sold	$4,902,000.00	
U. P. R. R. Co First Lien and Refunding Four Per Cent. Sterling Bonds exchanged for Dollar Bonds	1,800.00	
U. P. R. R. Co., common stock issued in exchange for Twenty Year Four Per Cent. Convertible Bonds retired and canceled	17,275,400.00	
	$22,179,200.00	
		$8,061,250.00
Capital Expenditures.		
Expenditures for construction and acquisition of new lines	$149,289.60	
Additions and betterments	10,350,075.95	
Equipment	1,059,968.86	
Cost of new lines, transferred from deferred assets	3,090,086.58	
Miscellaneous improvements and adjustments	124,037.00	
	$14,773,457.99	
Deduct for:		
Receipts from Improvement and Equipment Fund	$2,050,000.00	
Abandoned property, not to be replaced	442,813.80	
Other property sold	333,568.62	
	$2,826,382.42	
		11,947,075.57
Increase in Assets.		
Demand loans to Southern Pacific Co	$10,901,568.97	
Other demand loans and time deposits	10,805,392.63	
Advances for the construction of new lines	9,390,134.78	
Advances for steamships	1,013,167.38	
Lands and other miscellaneous property	357,381.54	
Rolling stock	2,694,748.32	
Due from proprietary companies	343,558.40	
Material, fuel, and supplies	1,547,665.72	
Current cash accounts	1,731,230.24	
Total increase	$38,784,842.98	
Less decreases:		
Cash	$17,908,362.35	
Loans to San Pedro, Los Angeles & Salt Lake R. R. Co.	3,099,371.69	
Stocks and bonds owned	1,413,375.41	
Unadjusted accounts	818,740.52	
Total decrease	$23,239,849.97	
		15,544,993.01
Total		$35,553,318.58

RECEIPTS.

Increase in Liabilities.		
Current cash accounts	$1,975,373.36	
Reserve for depreciation of steamships and rolling stock leased	188,330.56	
Due to proprietary companies	600,756.48	
		$2,764,460.40
Profit and Loss.		
Gross operating revenues and revenues from outside operations	$90,228,092.20	
Interest, dividends and other income	19,890,469.86	
Total revenue	$110,118,562.06	
Deduct for:		
Operating expenses and expenses of outside operations	$46,938,909.34	
Taxes	3,264,347.51	
Interest on funded debt and sinking fund requirements	12,471,590.48	
Dividends on preferred and common stocks	25,685,865.85	
Miscellaneous expenses and charges	1,925,540.70	
Total expenses and charges	$90,286,253.88	
Less:		
Difference between $30,231,950 face value, U. P. R. R. Co. Twenty Year Four Per Cent. Convertible Bonds, retired and canceled, and $17,275,400 par value common stock issued in exchange therefor	12,956,550.00	
Balance	$77,329,703.88	
		32,788,558.18
Total		$35,553,318.58

UNION PACIFIC RAILROAD AND AUXILIARY COMPANIES.

No. 10—Investment Stocks Owned, June 30, 1910.

Company.	Total Owned by Union Pacific Railroad and Auxiliary Companies.	+ Increase. — Decrease.
Atchison, Topeka & Santa Fe Railway.		
Preferred stock	.....	— $10,000,000.00
Baltimore & Ohio Railroad.		
Common stock	$32,334,200.00	.....
Preferred stock	7,206,400.00	.....
Chicago & Alton Railroad.		
Preferred stock	10,343,100.00	.....
Chicago & Northwestern Railway.		
Common stock	4,018,750.00	+ 803,750.00
Chicago, Milwaukee & St. Paul Railway.		
Preferred stock	1,845,000.00	.....
Great Northern Railway.		
Iron ore properties, 38,864 shares (*a*)	.....	(*a*)
Illinois Central Railroad.		
Capital stock	22,500,000.00	.....
New York Central & Hudson River R. R.		
Capital stock	17,857,100.00	+ 3,571,400.00
Northern Securities.		
Stubs	724,900.00	.....
Railroad Securities.		
Common stock	3,483,400.00	+ 500.00
Preferred stock	1,935,900.00	.....
Southern Pacific.		
Common stock	(*c*) 126,650,000.00	+ 36,650,000.00
Preferred stock	.....	—*b* 34,200,000.00
Total, 1910	$228,898,750.00	— $3,174,350.00
Total, 1909	232,073,100.00	.....

(*a*) Par value not stated in certificate. All sold during the year.

(*b*) Exchanged for common stock.

(*c*) Of this amount $108,000,000.00 is deposited as collateral under Oregon Short Line Railroad Co. Four Per Cent. Refunding Mortgage. Of the total $100,000,000 of bonds outstanding under the mortgage, $55,000,000 are a free asset in the treasury of the Union Pacific Railroad Co.

UNION PACIFIC RAILROAD AND AUXILIARY COMPANIES.

No. 11.—Bonds Owned of Other Companies, June 30, 1910.

Company.	Total Issued and Outstanding. June 30, 1910.	Owned by Union Pacific Railroad and Auxiliary Companies. Total.	— Decrease. + Increase.
Atchison Union Depot & R.R.			
Second Mortgage 5%	$31,500.00	$4,500.00	.....
Cheyenne County, Colorado.			
Refunding 5%	.....	26,200.00	.....
Green River Water Works.			
First Mortgage 6%	198,000.00	198,000.00	.....
Idaho Northern R.R.			
First Mortgage 5%	875,000.00	875,000.00	.....
Second Mortgage 5%	160,000.00	160,000.00	+$11,000.00
Ilwaco R.R.			
First Mortgage 6%	305,000.00	305,000.00	.....
Leavenworth & Topeka Ry.			
First Mortgage 4%	250,000.00	125,000.00	.....
Leavenworth Depot and R.R.			
First Mortgage 5%	150,000.00	63,000.00	.....
Northen Pacific Terminal.			
First Mortgage 6%	3,443,000.00	174,000.00	.....
Ogden Union R.R. & Depot.			
First Mortgage 5%	326,000.00	163,000.00	.....
Oregon, Wash. & Idaho R.R.			
First Mortgage 6%	3,000,000.00	3,000,000.00	+3,000,000.00
Payette Valley Ry.			
First Mortgage 5%	44,000.00	44,000.00	.....
Rattlesnake Creek Water.			
First Mortgage 6%	146,000.00	146,000.00	.....
San Pedro, Los Angeles & Salt Lake R.R.			
First Mortgage 4%	46,886,000.00	23,443,000.00	+3,443,000.00
Southern Pacific.			
4% Twenty-Year Convertible	81,151,000.00	927,000.00	—3,833,000.00
4½% Twenty-Year Gold	227,000.00	65,000.00	+ 65,000.00
Utah Light & Power.			
Consolidated Mortgage 4%	1,115,000.00	2,000.00	.....
Utah Light & Ry.			
Consolidated Mortgage 5%	1,485,000.00	993,000.00	.....
Collateral Trust 6%	250,000.00	41,000.00	.....
Union Pacific Coal.			
First Mortgage 5%	*5,000,000.00	3,507,000.00	— 188,000.00
Union Pacific Land.			
First Mortgage 4%	5,846,000.00	5,846,000.00	— 750,000 00
Total, 1910	.....	$40,107,700.00	+$1,748,000.00
Total, 1909	.....	$38,359,700.00	.....

*1,493,000 held by Union Pacific Coal Co. sinking fund.

Note.—The $5,846,000 first mortgage 4% bonds of the Union Pacific Land Company are pledged.

UNION PACIFIC RAILROAD AND AUXILIARY COMPANIES.

NO. 5.—ASSETS, JUNE 30, 1910.

(Excluding stocks and bonds owned of Auxiliary and Proprietary companies and all offsetting accounts between them.)

Assets.	June 30, 1910.	June 30, 1909.	Increase.
Capital Assets.			
Cost rys., equip. and app..	†$406,781,240.74	$394,834,165.17	$11,947,075.57
Stocks and bonds as detailed in Tables Nos. 9, 10 and 11..	208,561,011.65	209,974,387.06	*1,413,375.41
Trust funds	261,862.44	225,962.43	35,900.01
	$615,604,114.83	$605,034,514.66	$10,569,600.17
*Decrease.			
Current Assets.			
Demand loans S. P. Co....	$10,901,568.97	.....	$10,901,568.97
Loans to San Pedro, Los Angeles & Salt Lake R. R.	.....	$3,099,371.69	*3,099,371.69
Loans to Utah Lt. & Ry..	4,526,762.63	2,371,370.00	2,155,392.63
Cash	9,082,088.21	26,990,450.56	*17,908,362.35
Demand loans and time dep.	27,450,000.00	18,800,000.00	8,650,000.00
Agents and conductors.....	1,042,116.17	924,164.59	117,951.58
Traffic and car service.....	100,304.27	259,897.05	*159,592.78
Income accrued to June 30, on securities owned.....	4,939,580.50	4,845,863.25	93,717.25
Individuals and companies..	3,922,489.88	1,788,787.32	2,133,702.56
U. S. Gov't. transportation.	403,059.61	468,532.30	*65,472.69
Deposits against matured and called bonds	3,000.00	3,000.00	.....
Material, fuel and supplies..	12,631,156.74	11,083,491.02	1,547,665.72
	$75,002,126.98	$70,634,927.78	$4,367,199.20
*Decrease.			
Deferred Assets.			
Advances for const. and acquisition of new lines..	$46,620,519.57	$37,230,384.79	$9,390,134.78
Ocean steamships	6,132,890.48	5,119,723.10	1,013,167.38
Rolling stock	12,341,244.85	9,646,501.53	2,694,743.32
Term. prop. and other lands	4,357,334.20	3,999,952.66	357,381.54
Individuals and companies..	78,087.27	503,062.96	*424,975.69
	$69,530,076.37	$56,499,625.04	$13,030,451.33
*Decrease.			
Contingent Assets.			
Unadjusted accounts	$733,079.04	$1,551,819.56	*$818,740.52
Due from proprietary companies	1,311,747.00	968,188.60	343,558.40
Land and town lot contracts	2,749,622.94	3,117,300.66	*367,677.72
	$4,794,448.98	$5,637,308.82	—$842,859.84
Total assets	$764,930,767.16	$737,806,376.30	$27,124,390.86

*Decrease.

†The sum of $17,648,252.12 received to date from the Improvement and Equipment Fund and $16,959,816.24 appropriated from "Income Account," a total of $34,608,068.36, has been applied as a credit against this cost.

NO. 5.—LIABILITIES, JUNE 30, 1910.

(Excluding stocks and bonds owned of Auxiliary and Proprietary Companies and all offsetting accounts between them.)

Liabilities.	June 30, 1910.	June 30, 1909.	Increase.
Capital Liabilities.			
Union Pacific Railroad Company:			
Common stock	$216,577,700.00	$199,302,300.00	$17,275,400.00
Preferred stock	99,544,000.00	99,544,000.00	.....
Stocks of Auxiliary Companies in hands of the public, viz.:			
Oregon Railroad and Navigation Co.:			
Common stock	20,100.00	20,100.00	.....
Preferred stock	3,410.00	3,410.00	.....
Total stocks	$316,145,210.00	$298,869,810.00	$17,275,400.00
Funded debt (excluding bonds of Auxiliary and Proprietary Companies owned), Table No. 14....	297,449,150.00	322,785,800.00	*25,336,650.00
	$613,594,360.00	$621,655,619.00	*$8,061,250.00
*Decrease.			
Current Liabilities.			
Coupons mat., but not pres.	$152,767.74	$164,491.65	*$11,723.91
Coupons due July 1.....	3,190,130.00	3,973,120.00	*782,990.00
Interest accrued on bonds and loans to June 30....	1,425,009.50	1,150,634.51	274,374.99
Divs. due, but uncalled for	43,176.60	32,838.00	10,343.50
Divs. payable July 1—Oct. 1	12,819,797.00	11,902,188.50	917,608.50
Mortgage bonds satisfied....	3,000.00	3,000.00	.....
Vouchers and payrolls.....	6,143,765.45	4,863,303.41	1,280,462.04
	$23,777,646.19	$22,089,571.07	$1,688,075.12
*Decrease.			
Deferred Liabilities.			
Taxes assessed, but not due	$1,347,919.09	$1,109,448.33	$238,470.76
Hospital department	96,175.19	89,754.68	6,420.51
	$1,444,094.28	$1,199,203.01	$244,891.27
Contingent Liabilities.			
Insurance fund	$410,670.16	$368,263.19	$42,406.97
Reserve for depreciation on steamships and on rolling stock leased to other cos..	1,917,219.70	1,728,889.14	188,330.56
Union Pacific Coal Co.....	2,022,467.50	3,244,314.34	*1,221,846.84
Union Pacific Land Co.....	68,267.21	58,559.47	9,707.74
Due to proprietary cos.....	3,149,772.31	1,336,876.73	1,812,895.58
Principal of def. paymts. on land and town lot contrcts	2,749,622.94	3,117,300.66	*367,677.72
	$10,318,019.82	$9,854,203.53	$463,816.29
Balance to credit of profit and loss (Table No. 4)..	$115,796,646.87	$83,007,788.69	$32,788,858.18
Total liabilities	$764,930,767.16	$737,806,376.30	$27,124,390.86

*Decrease.

No. 27.—GENERAL OPERATING RESULTS.

	June 30, 1910	June 30, 1909	Increase or Decrease	Per Cent.
1. Average miles oper..	6,296.22	6,062.13	234.09	3.86
Revenues and Expenses. (*Rail Lines and Outside Operations.*)				
2. Gross revenues.....	$90,228,092.20	$78,750,461.55	$11,477,630.65	14.57
3. Gross expenses.....	46,938,909.34	37,945,085.56	8,993,823.78	23.70
4. Revenues over exp..	43,289,182.86	40,805,375.99	2,483,806.87	6.09
5. Ratio exp. to gr. rev. (*Rail Lines Only.*)	52.02	48.18	3.84	7.97
6. Total operating rev.	88,506,465.44	$77,360,429.36	$11,146,036.08	14.41
7. Operating expenses.	45,132,681.73	36,503,075.95	8,629,605.78	23.64
8. Net operating rev...	43,373,783.71	40,857,353.41	2,516,430.30	6.16
9. Ratio of oper. exp. to oper. rev.....	50.99	47.19	3.80	8.05
10. Oper. rev. per m. rd.	14,057.08	12,761.26	1,295.82	10.15
11. Oper. exp. per m. rd.	7,168.22	6,021.49	1,146.73	19.04
12. Net oper. rev. per m.	6,888.86	6,739.77	149.09	2.21
13. Oper. rev. per *rev. train* mile (*a*)...	3.21	3.40	—$.19	5.59
14. Oper. exp. per *rev. train* mile (*a*)...	1.64	1.60	.04	2.50
15. Net oper. rev. per *rev. train* m. (*a*)	1.57	1.80	—.23	12.78
Train & Locomotive Miles. Revenue service:				
16. T'l frt. train miles	11,995,708	10,256,036	1,739,672	16.96
17. Pass. train mls.(*a*)	14,260,161	11,056,313	3,203,848	28.91
18. Mixed train miles.	1,283,930	1,397,817	—113,887	8.15
19. Special train miles.	63,225	28,297	34,928	123.43
20. *T'l rev. tr. mls.*.	27,603,024	22,738,468	4,864,561	21.39
21. Frt.—Lt. & helping loco. miles	1,599,246	1,362,100	237,146	17.41
22. Pass.—Lt. & helping loco. miles..	826,575	659,984	166,591	25.24
23. Rev. ser. mixed—Lt. & helping loco. m..	32,546	29,787	2,759	9.26
24. Rev. ser. special—Lt. & helping loco. m.	13,265	9,674	3,591	37.12
25. Rev. ser.—*Total loco. miles* exc. switching	30,074,656	24,800,008	5,274,648	21.27
26. Rev. ser.—Switching loco. miles	4,405,689	3,596,635	809,054	22.49
27. Rev. ser.—*Total loco. miles* (*a*)	34,480,345	28,396,643	6,083,702	21.42
28. Non-rev. ser.—Loco. miles included in "Trans. Exp."(*d*).	574,562	498,518	76,044	15.25
29. Ratio of *light and helping* loco. miles to *rev. ser.* total *train miles*	8.95	9.07	—.12	1.32
30. Ratio of *helping m.* to *rev. ser.* total *tr. m.* exc. *running lt.*.	3.63	3.48	.15	4.31
Car Miles Revenue service:				
31. Ft. car mls—loaded	327,436,361	298,047,722	34,388,639	11.73
32. Frt. car m.—empty	101,689,023	96,964,632	4,724,391	4.87
33. Frt.—Caboose mls.	11,991,101	10,239,567	1,751,534	17.10
34. Tl frt. cr & cbse m.	441,116,485	400,251,921	40,864,564	10.12
35. Non-rev. ser.—Tl. ft. car and caboose m.	424,372	297,787	126,585	42.51
36. Tl. frt. c. & cab. m..	441,540,857	400,549,708	40,991,149	10.23
37. Rev. ser.—Pas. c. m. (*b*) (*c*)	95,192,504	80,448,996	14,743,508	18.33
38. Non-rev. pas. c. m..	215,166	187,687	27,479	14.64
Revenue service:				
39. Spec. car m.—Frt. and caboose	850,334	414,183	—63,849	15.42
40. Spec. c. m.—Pass..	475,346	107,354	367,992	342.78
41. T'l spec. car mls.	825,680	521,537	304,143	58.32
Average No. cars:				
42. In Pass. trains....	6.12	6.46	—.34	5.26
43. Loaded, in frt. trns —East or North.	24.46	26.27	—1.81	0.80
44. Loaded, in frt. trns —West or South.	24.85	24.01	.84	3.50
45. Loaded, in frt trns	24.66	25.14	—.48	1.91
46. Ld. & empty in frt. trns, excl. cabse.	32.21	33.47	—1.16	3.47
47. Ratio of loaded frt. c. mile. to total (*d*)	76.30	75.14	1.16	1.54
48. Ratio of empty frt. c. mile. to total (*d*) Miscellaneous.	23.70	24.86	—1.16	4.67
49. Av. cost M. of W. & S. pr m. of m. tr	$1,458.06	$1,185.26	$272.80	23.02
50. Av. cost of repairs & replacements per loco.	3,656.45	3,122.78	533.67	17.09
51. Av. cost of repairs and replmts. per pas. train car.....	1,286.66	1,188.86	97.80	8.23
52. Av. cost of repairs and replmts per frt. train car.....	121.68	99.75	21.93	21.98
53. Trans. exp. per total rev. *train mile* (*a*)	80.45 cents	78-79 cents	1.66 cents	2.11
54. Cost per loco. mile for which the attendant exp. are charged to "Trans. Expenses" ....(*a*)	63.35 cents	62.00 cents	1.35 cents	2.18

(*a*) Includes 552,485 miles run by motor cars. (*b*) Includes 883,649 miles run by motor cars and trailers. (*c*) Includes mileage of passenger-train cars in all trains. (*d*) Excludes non-revenue and caboose mileage.

FOURTEENTH ANNUAL REPORT OF THE ST. LOUIS AND SAN FRANCISCO RAILROAD COMPANY—FISCAL YEAR ENDED JUNE 30, 1910.

To the Stockholders:

The Directors herewith submit their report of the operations and affairs of the St. Louis and San Francisco Railroad Company's Lines (exclusive of the Chicago & Eastern Illinois Railroad), for the fiscal year ended June 30th, 1910.

The results of operation for the fiscal year were as follows:

Operating revenue (increase $3,408,953.33 or 9 per cent.)		$41,165,939.37
Operating expenses (increase $3,916,751.04 or 15.8 per cent.)		28,676,842.19
Net operating revenue (decrease $507,797.71 or 3.9 per cent.)		$12,489,097.18
Taxes		1,458,185.96
		$11,030,911.22
Miscellaneous income		2,300,428.72
Total income		$13,331,339.94
Interest, rentals and other fixed charges		12,209,380.77
Net income after providing for all charges		$1,121,959.17
Dividends paid—four per cent. on first preferred stock		199,742.12
Surplus carried to profit and loss		$922,217.05

The mileage and results of operation of the Orange & Northwestern Railroad and the Beaumont, Sour Lake & Western Railway which were included in the printed report for 1909 have been eliminated therefrom in the foregoing comparison, and also in all other comparative statements in this report. The two roads referred to were, during the past year, operated as separate properties and form parts of the New Orleans, Texas & Mexico Railroad Lines. See page 76 showing the mileage of roads comprising the lines of the New Orleans, Texas & Mexico Railroad.

The slight decrease, 88-100 of a mile in the average mileage operated, is caused by a remeasurement.

On pages 74, 75 and 76 will be found details of the mileage of all the Lines operated, owned or controlled, by this Company.

CAPITAL STOCK.

There was no change during the fiscal year in the Capital Stock issued or outstanding.

FUNDED DEBT AND EQUIPMENT BONDS AND NOTES.

The outstanding funded debt at June 30, 1910, was	$221,966,174.11	
The outstanding equipment trust bonds and notes were	15,700,521.79	
Total		$237,666,695.90
The outstanding funded debt at June 30, 1909, was	$199,339,619.30	
Less that of B. S. L. & W. and O. & N. W. R. Rs.	728,566,59	
Total	$198,611,052.71	
The outstanding equipment trust bonds and notes were	15,033,551.99	
Total		213,644,604.70
The net increase was		$24,022,091.20

The balance of the Fort Smith and Van Buren Bridge Company First Mortgage 6 per cent. bonds were redeemed and cancelled during the year, and the mortgage was released of record.

In May, 1910, $1,644,000 of the Five Year 5 per cent. Gold Notes of 1911 were redeemed and cancelled, and at the same time, funds were deposited with the Trustee to redeem on July 1, 1910, the balance of that issue, amounting to $5,856,000.

Funds were also deposited with The Mercantile Trust Company of New York for the payment at maturity (September 1st, 1910), of $492,000 of Memphis, Kansas & Colorado Railway Company First Mortgage 7 per cent. bonds.

The new issue of this company's New Orleans, Texas & Mexico Division First Mortgage Thirty Year Gold Bonds, dated March 1st, 1910, is secured by a first mortgage dated May 17, 1910, on the property of the New Orleans, Texas & Mexico Railroad Company, the latter Company assuming the payment of both principal and interest of the bonds.

The New Orleans, Texas & Mexico Railroad Company is operated separately and extends from New Orleans, La., to Brownsville, Texas, on the Mexican border, owning a half interest in the bridge across the Rio Grande River to Matamoros where connection is made with the National Railways of Mexico. A profitable interchange of traffic with the Mexican lines should result, beginning with the opening of this new International line in September of this year. Your Company owns all of the capital stock, except Directors' shares, of the New Orleans, Texas and Mexico Railroad Company.

On pages 19 and 20 will be found statements showing in detail the amount of new bond and note issues as well as the amount of bonds and equipment obligations redeemed or exchanged during the year, and on page 28 is given the details of securities remaining in the treasury as a current asset.

EQUIPMENT.

The following equipment was purchased during the fiscal year:

1. Under Trust Agreements:
   - 250 Oil Tank Cars.
   - 1,000 Steel Coal Cars.
   - 500 Steel Hopper Cars.
   - 250 Steel Underframe Flat Cars.
   - 150 Steel Underframe Cabooses.
   - 7 Steel Baggage.
   - 6 Steel Chair Cars.
   - 6 Steel Dining Cars.
   - 5 Steel Combination Coach and Cafe.
   - 10 Steel Combination Coach and Baggage.
   - 6 Steel Combination Coach and Mail.
   - 9 Steel Combination Baggage and Mail.
   - 22 Steel Coaches.
   - 20 Pacific Type Locomotives.
   - 30 Consolidation Locomotives.
   - 3 Brown Hoists.
   - 3 Steam Wrecking Cranes.
2. Purchased for cash:
   - 100 Commercial Ice Cars.

All this additional equipment was received at June 30, 1910, with the exception of six Combination Passenger and Mail cars, five Combination Coach and Cafe cars and six Dining cars.

CONSTRUCTION.

During the fiscal year a branch was built between Marion and Hulbert, Ark., connecting the tracks of the Frisco with the Chicago, Rock Island & Pacific Railway at Hulbert, a distance of 5.49 miles. This cut-off shortens the distance for through traffic between the two Lines, and materially facilitates transfer of freight between the terminal yards of these lines, relieving the terminal situation in Memphis proper, which is often congested.

Extensive yards were built at Marion to provide for such interchange.

GENERAL.

Much has been said of late respecting the obvious necessity of greater compensation for the railroads per unit of service rendered. In this connection it has been frequently stated that within the past few years, rates have already been raised and that the actual rate basis is now higher than in the recent past. Figures refute this so far as "Frisco" is concerned. On our 1910 ton miles, if we had received the rates of 1907, our freight revenues would have been larger by $933,729.32; at the rates of ten years ago, 1900, we would have had $2,291,881.06 more freight earnings. Our passenger rate per mile in 1907 applied to our 1910 passenger miles would have yielded us a further increase of $1,669,811.82. If the railroads are to serve the public adequately, net revenues must be preserved or increased by means of better rates and not by poorer maintenance; the public cannot afford the latter method.

Your company's property is receiving a substantial improvement in value by reason of the number of treated ties (creosote treatment) which are being put into the track, at an increased expense, borne by maintenance charges. This work was begun late in 1907; as of date June 30, 1910, more than three million creosoted ties had been used, at an additional cost for treatment and handling of more than one million dollars. The life of these treated ties is estimated at fifteen years or more, or approximately two and one-half times the average life of the untreated ties; the benefit to the property in reduction of maintenance charges on this account will not be noticeable for several years.

At the close of the fiscal year new automatic electric block signals had been installed and were in use on 325 miles of road, and work of that character is being actively pushed upon 404 miles more, a good part of which will be in service before winter comes.

A strike of coal miners on April 1, 1910, closed practically every coal mine in the states of Missouri, Kansas, Arkansas and Oklahoma, causing serious losses in many ways—the loss of gross and net earnings on commercial coal, decrease in tons handled per freight train and consequent increase in cost per ton handled, temporary increase in cost price of our engine fuel and, most expensive of all, the enforced additional cost of hauling company coal from Indiana, Kentucky and Alabama to Oklahoma, Kansas and Texas. At the close of the fiscal year the mines had not resumed operation. The cost to your lines in actual net earnings for the period April 1 to June 30, was probably not less than one million dollars. This, in addition to the difficult operation in consequence of an unusually long and severe winter, together with increases in wages—necessary and unavoidable—has given your operating officials little opportunity to show efficiency in the matter of transportation costs.

By an agreement with the Houston & Texas Central Railway Company and other Southern Pacific lines, close arrangements have been made effective for the transportation of freight and passengers via Dallas, Sherman and Fort Worth, and via Houston, Tex. This understanding largely serves our purpose as a connecting line between our properties north of the Red River and those in Southern Texas, and obviates the necessity of expensive construction through a territory already well occupied by north and south railroad lines.

The statement of industries located on the Company's tracks during the year as reported by the Company's Industrial Department shows the usual satisfactory increase. Three hundred and twenty new industries, costing approximately $5,727,000.00 and employing 8,400 men, were established during the year.

The usual statements showing the Condensed Balance Sheet, Income and Profit and Loss Accounts, and Statistical Statements, each including the figures of the Chicago & Eastern Illinois Railroad Company, will be found on pages 44 to 76.

The Interstate Commerce Commission has prescribed and issued a form of General Balance Sheet Statement for steam railroads and made same effective June 15th, 1910. That form has been followed in stating the Condensed Balance Sheet including the figures of the Chicago & Eastern Illinois Railroad Company, but the comparative balance sheet of the Company on pages 16 and 17 is stated as heretofore in order to make an intelligent comparison with the preceding year.

Cheerful acknowledgment is hereby made of the faithful and efficient service rendered by officers and employes during the year.

By order of the Board of Directors.

B. L. WINCHELL,
President.

October 1st, 1910.

GENERAL PROFIT AND LOSS ACCOUNT AND ADJUSTMENTS THEREIN,

June 30, 1909, to June 30, 1910.

CREDIT.

Balance at credit, as per annual report, June 30, 1909	$4,014,320.34	
Adjustment account omission of B. S. L. & W. Ry. and O. & N. W. R. R.	185,791.14	
Total		$4,200,111.48
Surplus for the year ended June 30, 1910		922,217.05
Total credit		$5,122,328.53

DEBIT.

Proportion for the year of discount on securities sold	$480,183.79	
Depreciation prior to July 1, 1907, in the value of equipment destroyed and dismantled during current fiscal year	225,922.11	
Sundry adjustments not affecting current year's income	21,616.40	
Total debit		$727,722.30
Balance		4,394,606.23
		$5,122,328.53
By balance at credit, June 30, 1910		$4,394,606.23

ST. LOUIS AND SAN FRANCISCO RAILROAD LINES.
CONDENSED BALANCE SHEET, JUNE 30, 1910, AND COMPARISON WITH PREVIOUS YEAR.

ASSETS.

Capital assets—	1910.	1909. With B. S. L. & W. and O. & N. W. figures omitted.	Increase or decrease.
Franchises and property	$214,003,890.94	$190,601,738.51	$23,402,152.43
Stocks and bonds owned	203,845.69	203,845.69	.....
Total franchises and property	$214,207.736.63	$190,805,584.20	$23,402,152.43
Leasehold estate (the Kansas City, Fort Scott & Memphis Railway)	58,642,263.69	55,203,841.11	3,438,422.58
Leasehold estate (Kansas City, Memphis & Birmingham Railroad)	9,257,609.78	9,175,875.76	81,734.02
Franchises and property, auxiliary companies	4,950,455.90	7,843,934.82	*2,893,478.92
Chicago & Eastern Illinois Railroad Company preferred stock (cost of)	9,321,550.00	9,321,550.00	.....
Chicago & Eastern Illinois Railroad Company common stock (cost of)	18,239,187.13	18,239,237.13	*50.00
Total	$314,618,803.13	$290,590,023.02	$24,028,780.11
Current assets—			
Cash in treasury	1,568,910.29	1,306,870.20	262,040.09
Cash in hands of fiscal agents	4,198,950.17	3,799,483.89	399,466.28
Cash with trustees for redemption of called bonds (see contra)	6,348,000.00	.....	6,348,000.00
Due from agents and conductors	634,268.59	536,841.33	97,427.26
Due from railroad companies account traffic	25,710.04	44,044.13	*18,334.09
Due from companies and individuals	2,375,852.23	1,670,966.45	704,885.78
Bills receivable	672,204.71	61,234.42	610,970.29
Due from United States P. O. Department	84,335.34	103,208.47	*18,873.13
Securities in treasury	9,269,958.32	7,024,078.66	2,245,879.66
Supplies on hand	3,873,795.63	3,071,499.15	802,296.48
Advances account construction	934,786.65	5,144,047.82	*4,209,261.17
Total	$29,986,771.97	$22,762,274.52	$7,224,497.45
Deferred accounts—			
Open carrying accounts in process of adjustment	747,074.05	593,250.75	153,823.30
Discount on bonds, carried in suspense, to be charged out in annual installments	9,788,690.67	4,849,094.56	4,939,596.11
Trustees sinking fund accounts	468,776.58	448,370.64	20,405.94
Sinking funds	32,483.30	78,184.07	*45,700.77
Total	$11,037,024.60	$5,968,900.02	$5,068,124.58
Total assets	$355,642,599.70	$319,321,197.56	$36,321,402.14

*Decrease.

NOTE.—In stating the assets and liabilities of the companies covered by this balance sheet, the holdings of the St. Louis & San Francisco R. R. Co., in the bonds and capital stocks of leased and auxiliary lines, are eliminated.

LIABILITIES.

Capital liabilities—	1910.	1909. With B. S. L. & W. and O. & N. W. figures omitted.	Increase or decrease.
Capital stock:			
First preferred	$5,000,000.00	$5,000,000.00	.....
Second preferred	16,000,000.00	16,000,000.00	.....
Common	29,000,000.00	29,000,000.00	.....
Total	$50,000,000.00	$50,000,000.00	.....
Funded debt	†165,128,204.11	142,549,332.71	$22,578,871.40
Equipment bonds and notes	14,152,521.79	13,045,551.99	1,106,969.80
Outstanding securities on leasehold estate (the K. C. F. S. & M. Ry.):			
Stock—			
Preferred certificates	13,510,000.00	13,510,000.00	.....
Funded debt	‡43,668,300.00	39,891,300.00	§3,777,000.00
Equipment bonds and notes	1,548,000.00	1,988,000.00	*440,000.00
Total	$58,726,300.00	$55,389,300.00	$3,337,000.00
Outstanding securities on leasehold estate (K. C., M. & B. R. R.):			
Funded debt	9,246,670.00	9,247,420.00	*750.00
Funded debt, auxiliary companies	3,923,000.00	6,923,000.00	§*3,000,000.00
Preferred stock trust certificates (C. & E. I. R. R.)	9,317,550.00	9,317,550.00	.....
Common stock trust certificates (C. & E. I. R. R.)	18,044,500.00	18,044,500.00	.....
Total	$328,538,745.90	$304,516,654.70	$24,022,091.20
Current liabilities—			
Audited vouchers and payrolls	4,586,767.04	4,137,127.45	449,639.59
Interest and dividends matured	3,106,763.90	2,687,582.83	419,181.07
Interest accrued (not due)	1,602,679.72	1,343,701.05	258,978.67
Taxes accrued (not due)	521,568.98	420,380.93	101,188.05
Notes payable	6,008,070.00	1,713,329.12	4,294,740.88
Bonds called for redemption (see contra)	6,348,000.00	.....	6,348,000.00
Total	$22,173,849.64	$10,302,121.38	$11,871,728.26
Provisional accounts—			
Sinking funds accrued	248,977.31	285,078.08	*36,100.77
Equipment replacement fund	278,945.35	9,745.42	269,199.93
Improvement fund (K. C. & M. Ry. & Br. Co.)	7,475.27	7,486.50	*11.23
Total	$535,397.93	$302,310.00	$233,087.93
Grand total liabilities	$351,247,993.47	$315,121,086.08	$36,126,907.39
Profit and loss	4,394,606.23	4,200,111.48	194,494.75
Total	$355,642,599.70	$319,321,197.56	$36,321,402.14

*Decrease.

†Excludes, in order to avoid duplication, $10,000,000 N. O. T. & M. Division bonds pledged as collateral to other liabilities included in "Funded Debt."

‡Excludes $492,000 Memphis, Kansas & Colorado Railway Co. first mortgage 7 per cent. bonds, maturing September 1, 1910, funds for redemption of which were held by trustee.

§$3,000,000 of Kansas City & Memphis Railway & Bridge Co. bonds transferred from "Funded Debt Auxiliary Companies" to "Funded Debt Leasehold Estate (the K. C. F. S. & M. Ry.)"

ST. LOUIS AND SAN FRANCISCO RAILROAD LINES.
INCOME ACCOUNT.
Fiscal Year Ended June 30th, 1910, Compared With Previous Year.

	1909-10.	1908-09. With B. S. L. & W. and O. & N. W. figures omitted.	Increase or Decrease.	Per Cent.
Average miles operated	5,071.79	5,072.67	—.88	...
Operating revenue—				
Freight	$27,645,863.48	$25,262,515.93	$2,383,347.55	9.4
Passenger	10,548,969.83	9,603,340.26	945,629.57	9.8
Mail	1,009,241.56	999,935.45	9,306.11	0.9
Express	1,134,904.37	1,129,201.66	5,702.71	0.5
Miscellaneous	550,811.88	527,951.03	22,860.85	4.3
Total transportation revenue	$40,889,791.12	$37,522,944.33	$3,366,846.79	9.0
Revenue from operation other than transportation	276,148.25	234,041.71	42,106.54	18.0
Total operating revenue	$41,165,939.37	$37,756,986.04	$3,408,953.33	9.0
Operating expenses—				
Maintenance of way and structures	$5,778,268.15	$4,987,632.77	$790,635.38	15.9
Maintenance of equipment	5,940,310.37	4,596,862.39	1,343,447.98	29.2
Traffic expenses	1,036,821.23	873,292.10	163,529.13	18.7
Transportation expenses	14,698,094.38	13,103,878.18	1,594,216.20	12.2
General expenses	1,223,348.06	1,198,425.71	24,922.35	2.1
Total operating expenses	$28,676,842.19	$24,760,091.15	$3,916,751.04	15.8
Net operating revenue	$12,489,097.18	$12,996,894.89	*$507,797.71	3.9
Taxes	1,458,185.96	1,532,148.60	*73,962.64	4.8
Operating income	$11,030,911.22	$11,464,746.29	*$433,835.07	3.8

*Decrease.

	1909-10.	1908-09. With B. S. L. & W. and O. & N. W. figures omitted.	Increase or Decrease.	Per Cent.
Miscellaneous income—				
Hire of equipment	†$609,988.27	†$260,086.63	$349,901.64	134.5
Other income	2,910,416.99	1,715,112.20	1,195,304.79	69.7
Total miscell. income	$2,300,428.72	$1,455,025.57	$845,403.15	58.1
Total income	$13,331,339.94	$12,919,771.86	$411,568.08	3.2
Interest	$7,447,805.63	$6,517,319.38	$930,486.25	14.3
Rentals and sinking funds—				
Interest on guaranteed securities	2,594,390.91	2,591,631.12	2,759.79	0.1
Other rentals and sinking funds	627,302.23	661,562.88	*34,260.65	5.2
Dividends on trust certificates, the Kansas City, Ft. Scott & Memphis Railway	540,400.00	540,400.00	.....	..
Dividends on trust certificates, Chicago & Eastern Illinois Railroad	999,482.00	1,094,482.00	*95,000.00	8.7
Total charges	$12,209,380.77	$11,405,395.38	$803,985.30	7.0
Available for dividends	$1,121,959.17	$1,514,376.48	*$392,417.31	25.9
Dividends—				
Four per cent. on first preferred stock	$199,742.12	$199,742.12	.....	..
Surplus carried to credit of profit and loss	$922,217.05	$1,314,634.36	*$392,417.31	29.8

*Decrease. †Debit.

CHICAGO AND EASTERN ILLINOIS RAILROAD COMPANY—TWENTY-FIRST ANNUAL REPORT.

FISCAL YEAR ENDED JUNE 30, 1910.

To the Stockholders:—

The Board of Directors herewith submit their report of the operations and affairs of the Chicago and Eastern Illinois Railroad Company for the fiscal year ended June 30, 1910.

The results of the operations for the fiscal year were as follows:

Total operating revenue (increase $1,480,736.60 or 14.4 per cent.)	$11,750,355.59	
Operating expenses (increase $1,019,450.33 or 14.7 per cent.)	7,953,983.84	
Net operating revenue (increase $461,286.27 or 13.8 per cent.)		$3,796,371.75
Taxes		362,124.30
Operating income		$3,434,247.45
Miscellaneous income		742,622.31
Total income		$4,176,869.76
Interest and rentals		3,001,079.60
Net income after providing for all charges		$1,175,790.16
Dividends paid (6 per cent. on preferred and 8 per cent. on common stock)		1,107,266.00
Surplus for the year		$68,524.16

For comparative income account in detail, see table on page 10.

There was no change in the capital stock of the Company during the year; the mortgage, bonded and secured debt shows a decrease of $281,057.76, and the working liabilities decreased $606,433.58.

The rate question is attracting much attention and it is pertinent to say that if the average passenger and freight rates received during the year 1900 had been applied to the traffic of this past fiscal year, your revenues would have been larger by $1,295,988.00, or if the rates of the year 1907 had obtained, your earnings would have been $1,001,143.00 greater.

The distribution of the increase in total operating revenue was as follows:

Increase in expenditures on the property (maintenance accounts)	$538,836.91
Increase in transportation, traffic and administration expense	480,613.42
Increase in net operating revenue	461,286.27
	$1,480,736.60

A little more than 31 per cent. of the total increase was saved for the net operating revenue, and the surplus available for dividends increased 69 per cent.

The cost of engine fuel and of yard service constitute the largest items in the increased cost of movement, the ratio of transportation expense to total operating revenue showing nevertheless a decrease of .54 of one per cent. Tons of all freight per train mile were 592.51, an increase of 17.71, while tons per loaded freight car mile rose to 30.40.

Thanks and credit are due to officers and employees for the faithful service which brought these results.

By order of the Board,

B. L. WINCHELL,
President.

October 1, 1910.

CONDENSED GENERAL BALANCE SHEET, JUNE 30, 1910, AND COMPARISON WITH PREVIOUS YEAR.

ASSETS.	1910	1909	Increase or Decrease
Property Investment:			
I. Road and equipment:			
Investment to June 30, 1907:			
Road	$34,654,422.67	$34,654,422.67	.....
Equipment	20,173,710.41	20,173,710.41	.....
	$54,828,133.08	$54,828,133.08	.....
Investment since June 30, 1907:			
Road	$815,972.73	$700,242.97	$115,729.76
Equipment	2,319,937.39	2,361,491.86	—41,554.47
	$3,135,910.12	$3,061,734.83	$74,175.29
	$57,964,043.20	$57,889,867.91	$74,175.29
Reserve for accrued depreciation	*Cr.*144,953.57	*Cr.*95,826.61	*Cr.*49,126.96
Total road and equipment	$57,819,089.63	$57,794,041.30	$25,048.33
II. Securities:			
Securities issued or assumed—Pledged:			
Funded debt	$729,000.00	$2,140,000.00	—$1,411,000.00
Securities of proprietary, affiliated and controlled companies —Unpledged:			
Stocks	373,231.76	373,231.76	.....
Total securities.	$1,102,231.76	$2,513,231.76	—$1,411,000.00
III. Other investments:			
Miscellaneous investments:			
Physical property	$208,551.28	$177,551.40	$30,999.88
Securities — Unpledged	1.00	1.00	.....
Total other investments	$208,552.28	$177,552.40	$30,999.88
Total property investments	$59,129,873.67	$60,484,825.46	—$1,354,951.79

ASSETS.	1910	1909	Increase or Decrease
Working Assets:			
Cash	$1,006,946.93	$1,153,841.93	—$146,895.00
Securities issued or assumed —Held in treasury:			
Funded debt	423,000.00	817,000.00	—394,000.00
Marketable securities:			
Stocks	4,171.42	.....	4,171.42
Funded debt	153,000.00	83,000.00	70,000.00
Miscellaneous	100,635.12	100,635.12	.....
Loans and bills receivable.	437,077.38	286,744.58	150,332.80
Traffic and car service balance due from other companies	317,531.27	204,476.47	113,054.80
Net balance due from agents and conductors	327,578.63	237,916.45	89,662.18
Miscellaneous accounts receivable	607,865.29	501,572.07	106,293.22
Material and supplies	1,038,243.04	1,061,574.47	—23,331.43
Other working assets	2,384.45	1,772.86	611.59
Total working assets	$4,418,433.53	$4,448,533.95	—$30,100.42
Deferred Debit Items:			
Advances:			
Temporary advances to proprietary, affiliated and controlled companies	$40,099.30	$40,099.30	.....
Working funds	1,055.58	865.54	190.04
Rents and insurance paid in advance	43,655.95	38,460.07	5,195.88
Unextinguished discount on securities:			
Unextinguished discount on funded debt	1,164,186.22	688,070.00	476,116.22
Special deposits	10,578,091.64	10,578,091.64	.....
Cash and securities in sinking and redemption funds	16,219.06	19,437.47	—3,218.41
Other deferred debit items.	386,202.31	190,159.66	196,042.65
Total deferred debit items	$12,229,510.06	$11,555,183.68	$674,326.38
Total	$75,777,817.26	$76,488,543.09	$710,725.83

NOTE.—The figures for 1909 have been revised under Interstate Commerce Commission classification.

LIABILITIES.	1910	1909	Increase or Decrease
Stock:			
Capital stock:			
*Common stock	$13,626,100.00	$13,626,100.00	.....
*Preferred stock	8,992,000.00	8,992,000.00	.....
Stock liability for conversion of outstanding securities of constituent companies	168.88	168.88	.....
Total stock	$22,618,268.88	$22,618,268.88	.....
Mortgage, Bonded and Secured Debt:			
Funded debt:			
In treasury (pledged or unpledged)			
Mortgage bonds	$1,152,000.00	$2,957,000.00	—$1,805,000.00
Outstanding (not held in treasury)			
Mortgage bonds	40,408,000.00	37,453,000.00	.....
Collateral trust bonds	27,000.00	27,000.00	.....
Equipment trust obligations	6,960,289.92	8,391,347.68	—1,431,057.76
Total mortgage, bonded & secured debt.	$48,547,289.92	$48,828,347.68	$281,057.76
Working Liabilities:			
Loans and bills payable	$500,000.00	$1,425,000.00	—$925,000.00
Traffic and car service balance due to other companies	250,421.31	127,039.18	123,382.13
Audited vouchers and wages unpaid	1,241,027.12	1,033,438.97	207,588.15
Miscellaneous accounts payable	313,741.91	108,302.22	205,439.69
Matured interest, dividends and rents unpaid	55,995.00	304,982.00	—248,987.00
Matured mortgage, bonded and secured debt unpaid	3,336.04	7,336.04	—4,000.00
Other working liabilities.	63,903.70	28,760.25	35,143.45
Total w'k'g liabilities.	$2,428,425.08	$3,034,858.66	—$606,433.58
Accrued Liabilities Not Due:			
Unmatured interest, dividends and rents payable	$713,192.92	$676,957.09	$36,235.83
Taxes accrued	221,345.53	188,399.93	32,945.60
Total accrued liabilities not due	$934,538.45	$865,357.02	$69,181.43
Deferred Credit Items:			
Operating reserves	$179,325.31	$164,119.71	$15,205.60
Other deferred credit items	259,046.77	172,633.75	86,413.02
Total deferred credit items	$438,372.08	$336,753.46	$101,618.62
Profit and Loss:			
Balance	$810,922.85	$804,957.39	$5,965.46
Total	$75,777,817.26	$76,488,543.09	—$710,725.83

*The Trust Company of America holds in Trust Assets $161,300.00 preferred and $6,408,300.00 common stock included in above figures.